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AN EXPERIMENTAL STUDY OF MIXED FEELINGS[1]

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[1]From the Psychological Laboratory, Cornell University.

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The term 'mixed feeling' may be used in a psychophysical or in a psychological sense. A psychophysical mixture is a mixture of conditions resulting in a single feeling, a *Totalgefühl,* just as the mixture red and green results in a single color or brightness. A psychological mixture is the strict coexistence of two feelings, just as red and green may be experienced side by side in the same visual field. Lehmann[2] has compared these two types to mechanical mixture and chemical union: "Die Psychologen haben bisher scharf gesondert zwischen 'Gefühlsmischungen' und 'Gemischten Gefühlen,' welche letzteren dadurch charakterisiert sein sollten, dass die einzelnen emotionellen Elemente so verschmolzen wären, dass diese sich nicht aussondern liessen, sondern ein einziges Gefühl bildeten. Das Verhältnis zwischen diesen beiden Zuständen, der Gefühlsmischung und dem gemischten Gefühl, sollte also den Gegensätzen völlig analog sein, die wir aus dem rein physischen Gebiete kennen, den mechanischen Mischungen und chemischen Verbindungen." In the present paper a 'mixed feeling' is a consciousness in which pleasantness (P) and unpleasantness (U) are strictly coexistent, a *Gefühlsmischung.*

We make no assumption regarding the number of feeling dimensions and the number of affective qualities. We start from the fact, generally admitted by psychologists, that certain experiences are reported pleasant and others unpleasant. Our problem is simply: Do pleasant and unpleasant experiences occur simultaneously? May pleasantness and unpleasantness coexist? This is a question of fact and the appeal, therefore, is to experiment.

Historical

Orth,[3] in 1903, studying the *Bewusstseinslage* of doubt, published in full 28 reports (7 tests for 4 subjects). He worked with groups of lines and points and gave his subjects problems the solution of which would arouse doubt. In his reports U is recorded 10 times (in 9) and P 5 times (in 4). A single paragraph refers to mixed feelings: "Besondere Beachtung verdienen die Aussagen der Vpn. Mayer in Versuch 7. Dort finden wir die Beobachtung von 4 sich folgenden Gefühlszuständen, nämlich erst Lust, dann Unlust, weiter wieder Lust und end-

[2]Lehmann, A. Die Hauptgesetze des menschlichen Gefühlslebens, 1892, 241.
[3]Orth, J. Gefühl und Bewusstseinslage, 1903, 127.

lich nochmal Unlust. Diese Folge scheint mir auf das Nichvorkommen von gemischten Gefühlen hinzuweisen." Hayes,[4] in 1906, at the conclusion of a study of the Wundtian tridimensional theory writes: "To us, it has seemed best, instead of extending the method of paired comparisons beyond the point now reached to other classes of stimuli, to change the venue of the problem altogether, and to attack it on the side of *mixed feelings.* A second article will therefore report an experimental study of these much-discussed processes." The second article was never published, but Professor Hayes has kindly permitted us to make use of his results. The work was done in the Cornell laboratory in 1905-06 with two subjects, but the unpublished article is based upon 134 reports of a single subject. Pairs of simultaneous stimuli were used, a stimulus to P with a stimulus to U: (1) taste solutions containing sugar and quinine in various percentages, (2) taste solutions (sugar or quinine) and sounds (chords or discords from forks), (3) sounds (chords or discords) and odors (valerianic acid, carbon bisulphate, essence of peppermint, cinnamon). The subjects were instructed "to attend to the sensations aroused . . . and then to recall the experience and report on the sensations and affections experienced." The result of the experiment was negative; "it seems that we often have side by side in consciousness, sensations (or complexes of sensations) that when alone are distinctly P or U. Here then we might expect to find P and U side by side; but the observer confidently asserted that they never did coexist." Alechsieff,[5] in 1907, attacked the problem from the standpoint of the tridimensional theory, combining the methods of impression and expression. Like Hayes he experimented with pairs of simultaneous stimuli: tastes and smells, tones and colors. He quotes 2 complete reports (from 2 subjects) and concludes: "Aus diesen und 27 ähnlichen Versuchen kamen wir zu dem Schluss, dass Lust und Unlust nicht gleichzeitig in unserem Bewusstsein existieren können, sie können nicht nebeneinander, sondern immer nur nacheinander von uns erlebt werden."

Johnston,[6] in 1906, at Harvard, set out to examine experimentally "whether it is really impossible that various feelings coexist and remain distinguishable." For stimuli he used simultaneous combinations of "sounds, colors, odors, simple figures, and tactual surfaces," and for the more complex feeling-states "sentences and pictures more or less morally and esthetically suggestive." Perry pictures were cut out and presented on a colored background; the colors "were allowed to play their part in the feeling aroused." The subjects (10 men and 2 women) were unable at first to obtain mixed feelings but "after considerable training, the subjects, with a single exception, *were all convinced that both feeling-tones, for tactual and visual impressions, could be present at once.*" Nakashima,[7] in 1906-07, also at Harvard, studying the time-relations of affective processes, instructed his ten subjects (among other things) to pay special attention "to inhibition, reenforcement, and coexistence, if there were such processes." In the work with complex visual impressions a single sentence tells the story:

[4]Hayes, S. P., A Study of the Affective Qualities, *Am. Jour. of Psychol.*, 17, 1906, 393.

[5]Alechsieff, N., Die Grundformen der Gefühle, *Psychol. Stud.*, 3, 1907, 259-263.

[6]Johnston, C. H., The Combination of Feelings, *Harvard Psychol. Stud.*, 2, 1906, 159.

[7]Nakashima, T., Time-relations of the Affective Processes, *Psychol. Rev.*, 16, 1909, 313, 319.

"There are a few cases of mixed feelings mentioned in the records of H, F, D and T." In another study,[8] Nakashima devotes a short section in the discussion of his incidental results to the subject of mixed feelings. One of 4 subjects reports a mixed feeling, but later declares: "I do not think (at any rate with an observer of my type) the method is suitable for settling the question." "The remaining observers are strongly of the opinion that mixed feelings do not occur." Koch,[9] in 1911, states that "die Behandlung der Fragen nach der Möglichkeit einer Mischung von Lust und Unlust. . . Veranlassung zu besonderen Versuchen gab." He worked with combinations of colors, tones, and with tastes, smells, and pain. He notes 8 mixed feelings reported by 3 (including himself) of 9 subjects. "In mehreren Beobachtungen wird das gleichzeitige Vorhandensein von Lust und Unlust im Bewusstsein festgestellt." Kellogg,[10] 1912-13 and 1913-14, in the Harvard laboratory, set out "to produce feelings as normal as possible under laboratory conditions, and in such a manner as to lead to interference." There were eight subjects in the first part (5 men, 3 women) and seven in the second (6 men, 1 woman), of whom one had also worked in the first. "For materials, picture postcards and pictures cut from magazines with a few from surgical books, were used." The pictures were exposed alternately at rates varying from 10 to about 115 per min. in a modified form of the Dodge tachistoscope. "The general method rests upon the known tendency of feelings to persist, and upon the qualitative opposition of feelings. These two opposed tendencies give something definite to be worked out." The published result contains 345 complete reports from which Kellogg draws the conclusion that "with some subjects, there is a tendency to parallelism," and further that "the occurrence of parallel or mixed feelings" is correlated with "(1) readiness of response—the occurrence of feeling even with rapid alternation—and (2) the scope of response—the occurrence of feeling from stimuli offered, despite the distraction of a task in mental arithmetic." Wohlgemuth,[11] in 1917, published a report of experimental work done at University College, London. He worked with single and paired stimuli, and his four subjects "had to introspect on something like 400 stimuli." A good many mixed feelings are found in the protocols, but Wohlgemuth does not mention this fact in his conclusion; he is especially interested in the differentiation of pain and unpleasantness.

Experimental

I. Plan of the Experiment

The present experimental work upon mixed feeling was done in the Cornell psychological laboratory from October 1917 to February 1918.

[8]Nakashima, T., Contributions to the Study of the Affective Processes, *Am. Jour. of Psychol.*, 20, 1909, 184.

[9]Koch, B., Experimentelle Untersuchungen über die Mannigfaltigkeit der elementaren Gefühlsqualitäten, Halle Diss., 1911, 8, 89.

[10]Kellogg, C. E., Alternation and Interference of Feelings, *Psychol. Monog.*, 18, 1915, 14-18, 89-90.

[11]Wohlgemuth, A., On the Feelings and their Neural Correlate, with an Examination of the Nature of Pain, *Brit. Jour. of Psychol.*, 8, 1917, 437-451.

Subjects. The following kindly acted as subjects: (B) Mr. H. G. Bishop, assistant in psychology; (Da) Dr. K. M. Dallenbach, instructor in psychology; (Di) Mr. F. L. Dimmick, assistant in psychology; (F) Miss C. L. Friedline, graduate student in psychology; (G) Miss J. M. Gleason, fellow in psychology; (H) Mr. L. B. Hoisington, instructor in education; (K) Miss M. Kincaid, graduate student working in psychology; (O) Dr. R. M. Ogden, professor of education; (W) Dr. H. P. Weld, assistant professor of psychology.

General Method. Our general method was to establish a relatively permanent affective consciousness of moderate intensity, and then by stimulation to superinduce a brief affection of opposite sign. If, for example, a stimulus to P is applied without disturbing the permanent conditions of U, one might expect to find a mixture of the feelings provided, of course, that the test be repeated a sufficient number of times.

At first we endeavored to catch P and U together by taking a snapshot of consciousness when we judged that the feelings had had time to mix. The subjects were instructed as follows:[12]

"In this experiment be passive and receptive. Let the experimental situation have its way with you. Make no resistance to the stimuli; let them have their full effect.

"When you hear the signal 'now,' report immediately the affective character of the experience which you were having at that moment. After this any further report, giving details of the experience, will be in order."

It was found, however, that the reports contained a good deal of ambiguity. Since in an experiment of this kind it is exceedingly important to have a clear statement of temporal relations, we decided to instruct the subjects to trace the course of feeling for a given interval. Accordingly the second paragraph of the instructions was changed to the following:

"There will be two signals: 'now. . . now.' After the second 'now' you will report the course of feeling during the interval between the signals."

This latter instruction was used for the greater part of the experiment.

Before every experimental hour we secured a written record of the subject's abiding mood.

Procedure. Every subject worked two hours a week, usually in the morning, and not on successive days. The work was uninterrupted except for the Christmas holidays.

The subject, with eyes closed, was comfortably seated in a Morris chair. The chair was in a curtained enclosure about 1.5 X 3 m. When visual stimuli were used, the room was darkened, and then illuminated by two 75 watt mazda daylight lamps about 1 m. above the chair.

The stimuli were arranged on tables outside the curtain enclosure. The experimenter entered the enclosure behind the subject, and the noise of his approach served as a preparatory signal. In the work with pictures (see below) the experimenter did not enter the enclosure, but through a trap in the curtain displayed the picture about 1 to 1.5 m. in front of the subject.

[12]All instructions were typewritten on cards 5 X 8 in.

Divisions of the Experiment. The experiment as a whole comprises four divisions.

In the first division we devised 'natural' situations that would evoke a relatively permanent feeling-consciousness. For example, we asked the subjects to omit breakfast; and when a hunger U had been obtained, we superinduced P by the smell and taste of food. In another situation P was aroused by stroking the forehead gently with velvet; U was superinduced by sandpapering the tip of the nose or chin, or by presenting the odor of stale cheese, H_2S, or asafoetida. In another situation we resorted to a form of torture in which water was made to drip on the subject's forehead and run down his face; when U was established we presented perfumes, chocolate peppermint candies, chords upon tuning forks, etc. Other situations involved P and U memories, dizziness, tickle in nose and ear with a broom straw, warmths and colds, honey, noise, and numerous other stimuli.

In the second division of the experiment we worked with single stimuli. The early reports contained a good deal of *Kundgabe,* and we thought that by simplifying the experiment a better quality of report might be obtained. The time between presentation of the stimulus and the first word of response was taken with a stop-watch. For stimuli we used 14 different odors, 10 taste complexes, 10 tactual complexes, and 10 auditory stimuli (tones and noises). These stimuli are included in the list below.

In the third division of the experiment simultaneous stimuli were used. At first a stimulus to P was presented, and when *E* thought that it had exerted its full effect a stimulus to U was added, and conversely. The following stimuli were used in combinations which for every subject proved to be the most effective.

1. Olfactory: vanilla, chocolate, orange, lemon, heliotrope, rose perfume, crab-apple blossom perfume, white rose perfume, turpentine, anise, cinnamon, oil of juniper, oil of bergamot, oil of mace, cloves, bitter almond, nitrobenzole, benzoyl chloride, nutmeg, coffee, asafoetida, stale cheese, onion, H_2S, castor oil, mutton tallow.

2. Gustatory: sugar solution, salt solution, quinine solution, vinegar, chocolate peppermint candy, sarsaparilla, alum solution, castor oil, solution of vinegar and quinine, apple, banana, honey.

3. Tactual: cotton (pressure and tickle), broom straw (tickle: nose and ear), sharp nail (forehead and cheek), velvet (stroke forehead), heated and cold brass (contact), sandpaper Nos. 1, 1.5, 2 (chin, nose, forehead, teeth, arm), clothes pin (pinched on nose), snap with rubber band on neck, rap with piano hammer on forehead, slap with lamella on face, pressure cold potato, itch from cowhage, current of air (on cheek or in ear).

4. Auditory: set of König forks c, d, e, f, g, a, b, c′ (first accented

octave; single tones, chords, discords), blown bottles, mouth organ, harmonium, organ pipe, metal fife (shrill), metronome (various rhythms), tomtom, rattle (objects in wooden box), sizzle (lithia in cup of water), crumpling paper, crash (wooden box dropped to floor), squeak (cork turned in bottle), filing saw and glass.

The work with superimposed stimuli was not clearly marked off from that with single stimuli; the two divisions were dovetailed, so that for a number of days the experimental hour was commenced with six to eight tests with single stimuli and was completed with superimposed stimuli.

In the fourth division of the experiment we worked with visual stimuli and aesthetic feelings. Following Kellogg we used pictures[13] but our method was different. We used large colored plates of skin diseases (40 X 55 cm.), plates illustrating the Japanese ornamental arts (30 X 40 cm.), plates of oriental rugs and runners (20 X 30 cm.), and a few Whistler etchings of smaller size. Pictures to P and U were shown alternately in both time orders. At first each picture was shown for 10 sec. so that the single test lasted 20 sec. Later 2, 3, and occasionally 4 alternations were made in the interval of 20 sec. Following Johnston we used colored forms; we combined agreeable colors and disagreeable forms, and conversely. Very little work, however, was done with colored forms, since the feelings aroused were weak and the judgments for the most part were intellectual.

In this final division of the work we also combined pictures with phonograph music, tuning fork tones, noises, and tactual stimuli.

II. Quantitative Results

Percentage of Mixed Feelings. Some of the reports are clear and positive statements that P and U were experienced at the same moment (Table I, col. 1). Other reports contain expressions of doubt and uncertainty regarding the simultaneity of P and U (col. 2). Still other reports were at first equivocal, and in these cases the subject was questioned[14] about

[13] The pictures used were: *Atlas of Portraits of Diseases of the Skin*, pub. Vienna and copied London for new Sydenham Soc., 1858-84; Audsley, G. A., *Oriental Arts of Japan*, 1884, I and II; Black, A. and C., *Oriental Carpets, Runners and Rugs*, London, 1910; *Moderne Decorationsmalereien*, 3 Aufl., 1890-91; Bacher, O. H., *With Whistler in Venice*, 1909.

[14] Later in the experiment we gave up the questioning method for a graphic. The subject was given paper and pencil and asked to draw the course of feeling for the period covered by the report. This suggestion came from subject K, who visualized the course of feeling. The graphic method eliminates the possibility of suggestion which is

the temporal relations. Occasionally the report was positive after the questioning (col. 3).

TABLE I

PERCENTAGE OF MIXED FEELINGS

Subj.	Positive reports	Doubtful reports	Positive by questioning	Total 1, 2, 3	Total[15] No. reports	Percentage mixed feelings
B	0	0	0	0	193	0
Da	0	1	0	1	275	0.36
Di	0	2	0	2	242	0.82
F	4	2	1	7	252	2.77
G	0	5	0	5	232	2.15
H	4	7	0	11	242	4.54
K	21	6	10	37	307	12.05
O	2	3	1	6	278	2.15
W	0	2	0	2	191	1.04
Totals	31	28	12	71	2,212	3.21

An inspection of table I shows that out of a grand total of 2,212 reports there are 71, or 3.21%, mixed feelings. Of these 71 reports 37, or 52%, are reported by a single subject (K). If we eliminate doubtful reports, there are left 43, or almost 2%, mixed feelings. Of this number 31, or 72%, are reported by subject K. If we limit our consideration to positive mixed feeling reports, we find 31, or 1.4%, of which 21, or 67.7%, are reported by subject K. Five subjects (B, Da, Di, G, W) report no positive mixed feelings. Coexisting P and U is at best a rare experience.

Not only is mixed feeling a rare experience but it is also a doubtful one. Of the 71 mixed feelings 28, or 39.4%, contain expressions of doubt and uncertainty. How far from the truth, then, is the statement of Ladd[16] that "almost all mental states which are marked by strong feeling in the case of developed minds are mixed feelings!"

Distribution of Mixed Feelings. The distribution of mixed feelings according to divisions of the experiment is shown in

inherent in the questioning method; and this is especially important since (in our experience) subjects who report mixed feelings are likely to be suggestible.

[15]In addition to these reports there are 130 taken with 4 subjects as follows: F 35, G 46, H 28, W 21. These reports were taken (after the main experiment) with special instructions (1) to attend to the first stimulus, abstracting from the second, and (2) to attend to both stimuli simultaneously. No mixed feelings were reported in this work.

[16]Ladd, G. T., *Psychology Descriptive and Explanatory*, 1894, 537.

TABLE II

TOTAL NUMBER OF MIXED FEELINGS ACCORDING TO DIVISIONS OF THE EXPERIMENT

Subject	Situations	Single R	Super-imposed R	Visual R	Totals
B	0	0	0	0	0
Da	0	0	1	0	1
Di	0	0	2	0	2
F	3	0	4	0	7
G	2	0	1	2	5
H	10	0	1	0	11
K	1	0	24	12	37
O	0	0	2	4	6
W	2	0	0	0	2
Totals	18	0	35	18	71

TABLE III

TOTAL NUMBER OF REPORTS ACCORDING TO DIVISIONS OF THE EXPERIMENT[17]

Subject	Situations	Single R	Super-imposed R	Visual R	Totals
B	97	43	35	18	193
Da	72	72	97	34	275
Di	52	78	58	54	242
F	76	63	69	44	252
G	62	62	65	43	232
H	75	66	70	31	242
K	84	75	97	51	307
O	63	63	82	70	278
W	60	64	25	42	191
Totals	641	586	598	387	2,212

tables II and III. It is clear that experimentation by the method of superimposed stimuli is productive of the most mixed feelings; it yields 5.8%. The work with visual stimuli comes second, with 4.6% mixed feelings. The work with situations comes third, with 2.8%. The work with single stimuli yields no mixed feelings, although the number of reports in this division is nearly equal to that in the work with superimposed stimuli. Surely, out of 586 tests with single stimuli, we might expect to find a few cases in which a P or U *mood* exists

[17]The columns correspond to the order of the experiment with the following exceptions: 54 reports of K and 23 reports of O in the division with superimposed R were given after the work with visual R.

TABLE IV

TOTAL NUMBER OF MIXED FEELINGS ON SUCCESSIVE DAYS OF THE EXPERIMENT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Da	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0						
Di	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0								
F	0	0	1	0	0	2	0	0	0	0	3	0	1	0	0	0	0	0	0					
G	0	0	0	0	2	0	0	0	1	0	0	0	0	1	1	0	0	0						
H	0	3	0	2	4	1	0	0	0	0	0	0	0	1	0	0	0	0						
K	0	0	0	0	1	0	0	0	3	2	1	0	1	1	0	0	4	7	3	2	2	3	5	2
O	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	4	0	0				
W	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0							

TABLE V

TOTAL NUMBER OF REPORTS ON SUCCESSIVE DAYS OF THE EXPERIMENT[19]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	4	16	8	20	11	16	9	13	15	20	15	8	9	7	4	1	4	6	5	2				
Da	8	20	11	14	11	8	27	33	22	17	20	14	13	6	14	13	11	13						
Di	5	17	16	14	36	30	14	21	13	15	7	6	13	15	12	9								
F	21	6	11	16	10	12	22	28	20	16	14	14	8	10	3	12	11	10	8					
G	5	14	11	16	9	7	18	31	19	16	16	14	13	7	7	14	8	7						
H	6	18	14	16	11	10	25	26	18	18	15	17	11	6	4	15	5	7						
K	4	20	18	19	8	15	29	28	18	13	13	9	8	5	9	15	10	12	8	10	7	12	9	8
O	4	13	9	16	10	11	28	24	21	9	17	11	12	12	15	21	12	10	10	13				
W	15	8	14	8	8	7	27	29	10	6	9	8	3	5	16	9	9							

simultaneously with the opposite affective quality! Some of the stimuli evoke both P and U, but not simultaneously; no mixed feelings are reported in this division of the experiment.[18]

The distribution of mixed feelings according to successive days of the experiment is shown in tables IV and V. Table IV shows that mixed feelings are reported in sporadic groups throughout the course of the experiment. The largest group is that of K, extending from days 17 to 24, which contains 28 mixed feelings out of 76 reports. This group stands in marked contrast to the apparently 'normal' record of K on days 1 to 16. K reports a smaller group extending over three days, 9 to 11, which is similar to that of H on days 4 to 6. There are four cases of single reports on successive days: G, 14 and 15; K, 13 and 14; O, 9 and 10; W, 4 and 5. Apart from these groups lasting for several days, mixed feelings are reported at random.

TABLE VI

DISTRIBUTION OF MIXED FEELINGS WITHIN THE SINGLE EXPERIMENTAL HOUR

Subject	Day number	Number reports	Report-numbers in which m.f. occurred
G	5	9	5, 6
H	5	11	4, 5, 6, 7
K	9	18	14—17, 18
K	17	10	3, 4—6—8
K	18	12	1, 2, 3—6, 7, 8—12
K	21	7	2, 3
K	22	12	8—11, 12
K	23	9	3, 4—6, 7—9
O	18	10	4, 5—8, 9

[18]The absence of mixed feelings in Wohlgemuth's group 1, taken with single stimuli, stands in clear contrast to the mixed feelings recorded in groups 2, 3, 4 in which paired stimuli were used. In Part I of Johnston's article, in which single stimuli were used, there is no mention of mixed feeling.

[19]The apparent irregularities in the number of reports given on different days are due to several factors. (1) In the early work the number of reports obtainable depended upon the elaborateness of the situation. In the hunger situation, *e.g.*, only a few reports could be obtained in the hour. (2) The number of reports obtainable with single stimuli was relatively large. The experiences reported upon were simpler than those of the other divisions. (3) When phonograph music was used only six or seven reports could be obtained in an hour. (4) In the division with visual stimuli, preliminary work was necessary such as arranging colors and forms in order of preference. (5) The experiences in the final division were more complex than the others and required longer time for report.

The distribution of mixed feelings within the single experimental hour is about the same as that shown in table IV for the experiment as a whole. There is a well-defined tendency for mixed feelings to occur in groups of 2, 3, or 4 consecutive reports. These groups, together with single isolated reports, occur sporadically throughout the experimental hour. Table VI shows this group tendency.

From the foregoing tables we conclude:

1. There are marked individual differences in the tendency to report mixed feelings. One subject (K) reports more than half of the total number, while another (B) does not even report a doubtful case. Five of the nine subjects report no unequivocal mixed feelings This result agrees with Johnston[20], Kellogg[21], Koch[22], and Wohlgemuth[23].

2. More than a third of the mixed feelings are doubtful.

3. Mixed feelings are reported in sporadic groups irregularly throughout the course of the experiment as a whole and throughout the course of a single experimental hour. This result agrees with Kellogg[24], Koch[25], and Wohlgemuth[26].

[20]Johnston, *op. cit.*, 177: "In this investigation, after considerable training, the subjects, with a single exception, *were all convinced that both feeling-tones, for tactual and visual impressions, could be present at once.*" The exception shows that mixed feelings were not universal. Since Johnston had 12 subjects, his percentages of mixed feelings were probably larger than those of Kellogg, Wohlgemuth, and ourselves.

[21]Kellogg, *op. cit.*, 83: The tendency to report mixed feelings "is quite strong with 'A' and 'B,' somewhat less so with 'N,' still less with 'K' and 'D,' and absent with 'E' and 'G.'" Two out of seven subjects report no mixed feelings.

[22]The mixed feelings noted in Koch's experiment were reported by 3 of 9 subjects.

[23]All of Wohlgemuth's unequivocal mixed feelings are reported by a single subject (F). Subject J reports a few equivocal mixed feelings; subject R a few doubtful cases. Subject P reports no mixed feelings.

[24]Kellogg, *op. cit.*, 78-9. Of six consecutive reports (N) numbers 2, 3, 4 are equivocal mixed feelings, number 5 is a U coexisting with P-U, number 6 is a U overlapping P-P. Other groups in Kellogg's reports are: 80-1 (D) in which there are 2 and possibly 3 consecutive mixed feelings out of 4 reports; and 74-5 (A) in which there are coexisting P-U, P-P, and happiness-sadness, in 4 consecutive reports. See further 65-6 (I); 48 (F); 43-4 (M). The importance of analysing the reports by groups is recognized in a foot-note, 24: "In all that follows, introspections should be read carefully, in groups . . . Much that seems wholly trivial in the rough statements of the notes, is full of meaning when read in this way."

[25]Koch, *op cit.*, 89. Of the 8 mixed feelings noted 2 occur in consecutive reports and 2 more have a single report intervening.

[26]Wohlgemuth, *op. cit.*, 444-7 (F). Here is a group of 10 reports

(Johnston publishes no data, so that we are left in the dark regarding any group-tendency in his experiment.)

III. Analysis of the Reports

Preliminary Analysis. Our protocols contain a good many ambiguous reports which, if taken at their face value, might possibly be interpreted as mixed feelings. Following are a few examples:

"I felt pleased by the odor and very much displeased by the bristle" (B 22). "The tickle is U but the humor of the situation is P" (B28). "That's both P and U. . . I detected in the tasting of the candy both P and U and I should say that the P predominates" (B91). "Both Ps and Us came in there" (Di 14). "Very weakly P and very weakly U" (Di 198). "This is about half and half. Only a slight step over from P to U" (F17). "The air from the fan was P but the experience on the whole was U" (F 32). "The taste quality was P but tactually it was rather U"(G 27). "I felt the presence of the water as an undertone of P; yet the U was not at all intense"(H 44). "At times there were flashes of U. The general feeling throughout was P" (K 63). "The second was mostly P with a decided flash of U that lasted for quite a while" (K 207). "The P increased and abruptly disappeared simultaneously with the rise in U" (K 262). "A background of U with an occasional P coming in" (W 54).

Most of these reports owe their ambiguity to the omission of temporal relations. With F, however, ambiguity is frequently due to a tendency to sum up the experience as a whole. When asked what was meant by "the experience as a whole was P" the reply was that she "adds up the Ps and Us from first to last of the experience" (F 29). This tendency to add up the experience affectively is not lacking in other subjects. Da shows a marked tendency to estimate and compare the intensity of affective experiences. These tendencies to estimate and compare and summate give rise to temporal ambiguity.

It is needless to remark that in an experiment concerned with the coexistence of P and U ambiguous reports must be discarded. Even the report of a "mixed feeling," which is fairly common, does not guarantee coexistence. This may be seen in the following illustrations:

"A mixed feeling towards that clothes-pin on my nose. . . I never noticed the two elements there together. I believe they alternated" (B 149). "The mood is a P and U mixture, if I take the intermingling of the two as a mixture . . . I am never able to catch P and U alongside of each other" (B 190). "The regret is what I call a

with mixed feelings: (1) P-U, (2) equivocal U-U, (3) two fused Us, (4) P-U, (5) P-P-U, (6) P-U-P, (7) equivocal P-U, (8) U-U, (9) U-U-U, (10) U-U. This certainly looks like a group tendency!

mixed feeling. I should say it was a very, very rapid fluctuation between P and U . . . You get the succession P-U-P-U (I can't say how many times) as a unitary thing" (G 198). "The odor was a mixed feeling . . . I can't say that the affects were simultaneous; they may have been oscillatory" (O 195).

Illustrations of temporal and verbal ambiguity can be found in the protocols of Kellogg,[27] and Wohlgemuth.[28]

The mixed feelings indicated in column 3 of table I contain some expression of doubt regarding the simultaneity of P and U. Following are examples:

"The P *seemed* to be riding on the crest of the mood; it seemed to be carried along by it. Here you have a U mood, and if the sensations are isolated by attention they are P, but when you attend to the whole of consciousness they are different. *I think* that in spite of the P sensations (P when isolated) consciousness was U" (Da 260). "I tried my best to see what happened when the music was playing and I got the odor; *I really don't know.* I know the music was P and I know the odor was U, but I don't know whether they were there at once. The two stimuli were there at once" (Di 182). "P though *I don't know;* I might just as well have said U there . . . *I think* I should have said P-U or U-P . . . They *seemed* to be up and down in consciousness—first one and then the other" (G 51). "The noise was U. You *seemed* to have a tone of P all the time. It bobs up every time it has an opportunity, and even *seems* to be present at the instant you said 'now' when I reported U" (H 46). "If P and U can coexist, *I guess* they were there" (K 62). "The idea of blowing on my cheek was U and the cool air on the cheek was P, and *so far as I can say* they were there at the same time" (O 135). "*I can't say* for the life of me whether the U of the dripping wet was there at the same time as the vague P of the scent" (W 39).

The mixed feelings shown in column 2 of table I contain no ambiguity and doubt. They are clear and positive statements that P and U were experienced simultaneously. Following are examples:

(U memory, perfume) "Here were two things in consciousness. There was the U situation in which I was all keyed up. I felt very tense about it and was almost on the verge of tears. Then on the borderline of consciousness was an odor which I recognized as slightly P. The U of the memory was still there" (F 72).—(Odors: cinnamon, cinnamon *plus* asafoetida, asafoetida) "P. P and U at the same time. Very U." (Answer) "I got two things, and it was as if one were in each nostril. On the left I got P and on the right I got U. It was like a stereoscope with red and green; at one moment red is there and at the next moment green is there. The thing flashed back

[27] In the group of N referred to in Note 24 the equivocal mixed feelings are temporally ambiguous. Illustrations of temporal ambiguity are so numerous and general that it seems hardly necessary to quote specific cases.

[28] Wohlgemuth, *op. cit.*, 442-3 (F) group 2 contains several ambiguous reports. See further 447 (J) group 2; 439-440 (R) group 3. The latter contains one equivocal and 3 doubtful reports.

and forth" (F 166).[29]—(Sandpaper forehead, perfume) "U but still the P of the odor was present. You have U from one field and P from another. They didn't seem to neutralize each other or even to alternate" (H 16).—(Torture, perfume) "The P was a weak central core in the middle of me. The P did not extend below the thorax. The U was all over the body even to the feet, only it didn't get inside of me. They seemed decidedly there at the same time. They didn't seem to mix or fuse. They seemed to be two disparate things but they were both there" (H 60).—(Buttered toast, odor stale cheese) "P from the toast. An increase in P due to amusement. Then a slight flash of U coexisting with the P" (K 254).—(Sandpaper nose, perfume) "Both P and U were certainly there together. Occasionally each one would be there alone and the other disappeared, but in the intervals between they were there together" (K 301). — (Whistler etching, odor stale cheese) "There were touches of aesthetic P and there was the U from the odor. The odor was strong and I was still looking at the picture. When the distraction ceased I had both simultaneously. The cheese was U and the picture was aesthetically pleasant. I had both simultaneously for a moment" (O 249).

In addition to the 71 mixed feelings there are 5 reports of what we choose to call "multiple feelings." There are two cases of coexisting Us; two of coexisting Ps; and one of 3 coexisting Ps. Following are the reports:

(Mouth organ, slap face) "That is apparently twofold. There is a deep-seated resentment and the U of the sting. . . The two Us seemed to be there together" (O 151).—(Music, odor stale cheese) "The odor fluctuated with the music. At one point it is disagreeable music and at another point it is music and disagreeable odor combined . . . . I couldn't say whether both Us were there together or whether it was a combination" (O 174).—(Torture, peppermint) "The peppermint seemed to stand out as a P by itself; but the other P (of the rhythm) persisted right through" (G 55). —(Music, tickle) "Both experiences were P, and one was a tickling P and the other a soothing P. You seem to get the body divided. All down the central core and on my left I could feel the smooth swaying rhythm of the movement, whereas on the right of the head and shoulder there was this P tickling feeling" (H 73).—(Sight human flesh and bones, taste sarsaparilla) "It seemed as if I had three simultaneous Ps; there was interest in the visual, P in the gustatory, and in the olfactory. They all blend into each other and make a uniformly P experience. I think the P from all three was there together; but I distinguished the three alternately" (K 194).

So far as the problem of coexistence is concerned, "multiple feelings" resemble mixed feelings in every respect except that the sign of the coexisting feelings is the same. Like mixed feelings they also contain a good deal of doubt and ambiguity.

In view of the fact that our stimuli were chosen to arouse simultaneous P and U, the occurrence of 5 "multiple feelings" indicates that with properly chosen stimuli "multiple feelings" might be reported in equal (possibly greater) percentages with mixed feelings. "Multiple

[29]This is probably an alternation of feeling. The mixed feelings in every case have been given the benefit of a doubt.

mixed feelings" are found in the protocols of Wohlgemuth,[30] Kellogg,[31] and are mentioned by Johnston.[32]

Types and Forms of Report. The reports may be grouped into two clearly-defined types: (1) psychological reports *of* experience, and (2) common-sense statements *about* the object of experience. Fortunately the bulk of our data are of the first type, while the common-sense statements are distinctly in the minority.

The psychological reports are characterized by clearness and definiteness of statement regarding the temporal relations and course of P and U during the interval reported. They contain no temporal ambiguity. They are detailed accounts of the rise and fall, the fluctuations and alternations of P and U. Examples of the psychological reports, chosen at random from our data, are given below:

(Oil mace, tomtom) "There was pretty near an equality of P and U. I got P quite strong at first and then there was a shoot of U but not extreme. Then attention fluctuated back and forth and P and U fluctuated. Now there is no difference between them. It is hop, skip, and jump—and it's all over" (Di 163).—(Picture skin disease, Japanese art) "The first was U; the next was P. A relaxed feeling—relief, no strain. There was no carrying over; the transition was quick as a wink" (F 210).—(Japanese art, noise) "P, U, P, alternating, depending on whether attention is focused on the red or the blue. Then I was conscious of the auditory stimulus but it contributed no feeling whatever" (F 233).—(Velvet, sandpaper) "First U with a varied sensory content. The P was persistent; I think it disappeared perhaps once. I don't know what to say about the rest. There seemed to be a background of U. I was uncomfortable but the sensory experiences were both P. What happened, I know, was that while I was attending to the sensory experience I got the P and as soon as it was gone I got the uncomfortableness and the U would sometimes just cut across the P" (G 171).— (Sandpaper, velvet) "First P; there is no question about it. It was followed by U. There was surprise and resentment. Then alternating P and U; then U; then P; then neutral and just at the end it was P" (H 162).—(Peppermint candy, odor stale cheese) "At first the experience was P, fairly uniform, then it became very U. The U subsided somewhat. Then just for a very short interval the P came up. Mixed with that was a U feeling of perplexity. The P preceded the perplexity; I shouldn't say they were there together. Then the U reappeared slightly more intense than before" (H 168).—(Sarsaparilla, slap) "That's a hard one; it is almost impossible. There was a P which came and went; I think it fluctuated between P and indifference. Then a

[30] See Note 26.

[31] See Note 24, subject N.

[32] Johnston, *op. cit.*, 179. "When there is a clear strife between the two, they both can exist as equal partial tones with an undertone of unpleasantness in the failure to coordinate them." We take this to be the account of a multiple feeling. Cf. Titchener, E. B., *Feeling and Attention*, 1908, 54.

sharp U which was a very sudden shift from P to U; the P was gone completely. That lasted at slightly less intensity until the second signal. The taste was baffling; it wasn't known; it was a strange something. The baffledness must have been U as I recall it now, but it wasn't there all the time and there was some curiosity mixed up with it. It's too complex!" (W 136).—(Music, picture skin disease) "U at first which increased gradually for some little time. Then gradually, not suddenly, it changed to P and then back to U, and I think that the degree of U was just as much as it was before" (W 157).—(Pictures: mural decoration, skin disease) "Mildly P which fluctuated as my eye traveled up and down. I wasn't very fond of it. Then there was an interval of practically indifference, possibly a vague P. With the second it started at U but quickly shot to U of a high degree" (W 160).

In the above examples the course of P and U is traced for intervals varying from 3 to 20 secs. The bulk of our data are of this kind. They contain no mixed feelings. They contain the statement that P and U alternated or fluctuated—sometimes slowly, sometimes rapidly, sometimes so completely 'jumbled' that a full report is impossible—but there is not a single case of coexisting P-U to be found in the reports of the psychological type.

The second type of report is characterized by common-sense statements about the object of experience, usually the stimulus-object. There are two sub-types which we shall call the objective and the subjective. In the objective type P and U are referred or attributed to the object[33], *e.g.* 'the object is P,' 'the U is from the object,' 'this is a P object,' etc. The subjective type is characterized by statement of an attitude toward the object, *e.g.* 'I like the object,' or by the effect of the object upon me, *e.g.* 'the object displeased me.'

The more important forms of the objective type are:

1. 'The object was P,' 'the object was U.'

"The tickle is U but the humor of the situation is P" (B 28). "The candy was P. The itch was U but it fell pretty much in the background when I focused on the candy" (B 83). "The mixup of the two rhythms was very U" (B 166). "The bottle was always P and the clicking was always U" (B 174). "The coolness was P; the sour was U; the bite was U" (Di 13). "The cold water was U" (O 41). "The perfume is P; the wind is P; the experience as a whole is P" (F 33). "I suppose the joke was P" (K 83). "I can't decide about the second stimulus. In a way it was P but it sent a chill down me and that was U" (K 156). "The amusement was P" (K 190). "The breeze had

[33]The term 'object' is here used in a most general sense. It includes, *e.g.*, tickle, humor, candy, bottle, mixup, breeze, music, joke, idea, etc., etc. In many cases the 'object' is the stimulus-object. In some cases the 'object' is reported in a psychological form, *e.g.*, a sensation, a color, a tone, etc.

been very P; the perfume was slightly U" (G 23). "The very idea of having my neck sandpapered was U but still there was an agreeable curiosity as to how it would feel" (W 7).

In addition to the above the following are selected from the 71 reports of mixed feeling: "The mood was still apparent but the cutaneous sensations were P" (Da 260). "There is no doubt but that the music was P and no doubt but that the prick was U" (Di 184). "Putting my hand in the water was P" (G 50). "The noise was U" (H 46). "After I got the taste of the peppermint it was P but the dripping on my nose made the whole thing U" (K 62). "The second was very U" (K 166). "The intangibleness of it excited my curiosity and that was P . . . When it did come that amused me and that was the P part" (K 182). "The irritation was U, so you have at the same time the U irritation and the P" (K 196). "The idea of blowing on my cheek was U and the cool air was P, and so far as I can say they were there at the same time" (O 135). "The pressure on the skin was U" (O 254).

2. 'The U is from the object,' 'the P is of the object,' 'the U is caused by the object,' 'the P is due to the object,' etc.

"The P of the peppermint was very greatly exceeded by the U of the sandpaper" (Di 20). "The U from the tickle was more pronounced than the U from spilling the stuff on my clothes" (O 23). "The odor at the end gave a momentary P" (F 13). "The feelings due to the stimuli were not P" (K 64). "P came from the auditory experience" (K 215). "A more permanent state is slightly U due to H_2S in the air" (G 13). "A mild P from the warmth of the water. Quite a strong P from the tactual pattern as I put my hand down in the water" (G 38). "The P I reported was due to the quality and volume of the odor" (G 67). "P of the food; still there was the U of the hunger but I wouldn't say at the same time" (H 1). "The U of the sandpapering was so great as to distract from the perfume" (W 9).

In addition to the above the following are selected from the 71 reports of mixed feeling: "The U of the memory was still there" (F 72). "There seemed to be both the U of the odor and the P of the rubbing" (H 10). "U but still the P of the odor was present. You have the U from one field and the P from the other" (H 16). "Slightly P from the body and more intense U from the sandpapering" (H 18). "P predominated; it was due to the amusement, the auditory experience and the rhythm" (K 196). "P caused by amusement and associations" (K 296). "P from the toast; an increase in P due to amusement" (K 254). "I got P from one and U from the other at the same time" (K 285). "First P of the odor; then U of the sound with the P odor still there" (O 140). "I can't say for the life of me whether the U of the dripping wet was there at the same time as the vague P of the scent" (W 39).

3. 'A P object,' 'a U object,' 'an object P,' 'an object U.'

"The P tones were irritating" (B 22). "The one starts up a P sensation and the other a U emotion" (Di 31). "I can't tell you whether there is any P there aside from the odor P" (Di 163). "There was a U itching on one of my legs before the odor came" (O 63). "In the original experience I didn't analyse, but as I remember it now the odor had qualities that belong to U odors and qualities that belong to P odors" (O 278). "P sensations on the right from the

warm and then P sensations on the left arm from the cold water" (Da 52). "I detected a P odor and I fully expected a P perfume, so when the U odor came it was exceedingly U" (F 7). "P, even more P than the cutaneous P" (K 179). "The P surprise seemed to fuse with the music" (H 72). "It was an ideational U" (H 226). "P expectancy before the first" (W 175).

In addition to the above the following are selected from the 71 reports of mixed feelings: "When I have a P mood the P sensations seem a part of it, but here you have a U mood and if the sensations are isolated by attention they are P" (Da 260). "At the same time in consciousness was a very P odor" (F 38). "It is difficult to say whether just the odor was there or whether a P odor was there" (O 140). "Then an aesthetic P and the U odor for the rest" (O 250). "The undercurrent of U was there at the same time as the P olfactory" (K 171). "P was largely an inclination to move toward the P sensory experience" (K 317).

4. 'P was the object,' 'U was the object.'

"The U was a sort of visceral thing" (B 175). "The P is a relaxed and at-ease feeling. The U is a muscular tightening-up and tension" (F 192). "The P is a relaxed feeling" (F 194). "It seems that the organic sensation *is* the P localized" (H 148).

In addition to the above the following two examples are found in the 71 mixed feeling reports: "The P was a weak central core in the middle of me. The P did not extend below the thorax . . ." (H 60). "P was largely an inclination to move towards the P sensory experience" (K 317).

5. 'The object was experienced as P.'

The following two examples are found in the 71 mixed feeling reports: "Then there was on the border line of consciousness an odor which I recognized as slightly P" (F 72). "If one is there as P and the other is there as U, then they must be there together" (K 301).

The objective type of report is characterized by reference of P and U to the object and by statement *about* the object, rather than by description and report of affective experience. The principal forms of reference and statement have been given above. Forms 1 and 3 attach the *meaning of pleasantness* (or unpleasantness) to the object. In daily life we frequently say 'the day is pleasant' or 'this is a pleasant day,' by which we signify that the *meaning of pleasantness* attaches to the day, and not that ' I feel pleased.' Form 2 refers to the object as the source from which pleasantness or unpleasantness is derived. This form resembles the stimulus-error[34]

[34]On the stimulus error in psychophysics see: Titchener, E. B., *Exper. Psychol,* II, ii, 1915, lxiii (and other references in index). On a similar error in the literature of thought see: Titchener, E. B., *Exper. Psychol. of the Thought-Processes,* 1909, 145 ff; 267, note 64. "The name 'stimulus error' is natural, since the confusion lies, in terms of Fechnerian psychophysics, between 'sensation' and 'stimulus.' Intrinsically, however, 'thing-error' or 'object-error' would be a better

of psychophysics. A naïve observer, *e.g.*, will state what the experience is *of* (*i.e.*, the stimulus-object), rather than describe what it *is*. The statement that P or U comes from such-and-such an object is not a direct 'report of' but rather a 'statement about' experience, *Kundgabe* rather than *Beschreibung*. Forms 4 and 5 (rare) seem to identify P or U with the object[35]. The nature of this identification will appear later.

Reference to the object is not found in the psychological reports (see above examples); these trace the qualitative and intensive course of P and U with little or no mention of object.

There is, however, one form of report that might be confused with the psychological type. There is a well-defined tendency to abbreviate 'the P object,' 'the U from the object,' etc., to 'the P' and 'the U,' and by a further process of abbreviation to 'P' and 'U' simply. Such abbreviations resemble the true psychological form of report if considered apart from the group of reports in which they are set. That they are, in truth, only abbreviations is shown by several facts. In the first place, a good many of the reports contain explicit objective reference in one part and the briefer form in another. The following illustrations are selected from the 71 mixed feeling reports:

"There is no doubt but that the music was P and no doubt but that the prick was U, but I can't tell you whether the P and U were there at the same time" (Di 184). "The U of the dripping water seemed to be confined more to the skeletal muscles . . . The U was reduced by the odor" (H 58). "The U grew less in time and degree while the P was gaining all the time in the exchanges. Perhaps there was an appreciable interval between P and U that I should say was both" (H 208). "Amusement was the P part. The actual sensory thing was U . . . P and U were there together" (K 182). "P from the toast; an increase in P due to amusement. Then a slight flash of U coexisting with the P" (K 254). "Faint P and U running along together. The P was amusement" (K 269). "U and P were there together absolutely all the way through the experience except at the very instant that the cutaneous experience that gave U began" (K 306). "U and P were simultaneous. P was largely an inclination to move towards the P sensory experience" (K 317).

In the second place, reports containing the forms 'the P,' 'the U,' 'P,' 'U' are sometimes set in a group which as a whole is characterized by objective reference. In view of the tendency for reports of a certain type to occur in groups, it is

phrase; what the naïve observer confuses with his mental process is not the physical stimulus, but the thing of common-sense."

[35]Koch, *op. cit.*, 10. Subject Sp, who reports 4 of the 8 mixed feelings, states: "Die Organempfindungen scheinen mir mit dem Gefühl identisch zu sein." This may be compared with H's statement: "It seems that the organic sensation *is* the P localized" (H 148).

probable that the brief forms are abbreviations. In the third place, the total reports in which these forms occur are exceedingly brief. In one group of mixed feelings, of subject K, the records contain little more than the bare statement that P and U coexisted. The brevity of the reports is a further indication that the forms in question are merely abbreviations.

The subjective type of common-sense report is much less frequent than the objective. It is, however, used to some extent by all the subjects, and in the case of a single subject (B) it is found in nearly 50% of the records.

The usual form of the subjective report is:

1. 'I like the object,' 'I dislike the object,' 'I enjoyed the object,' 'I was indifferent to the object,' 'I didn't mind the object,' etc.

"U; I don't like that odor" (B 8). "Just for an instant I didn't like that scraping but then I got used to it and didn't mind it because I enjoyed the warmth on my arm too much" (B 37). "Oh, that wasn't bad. I enjoyed the odor so much that I didn't mind the scratching. I didn't like the scratching but I didn't mind it much in view of the odor" (B 48). "I didn't like the music" (B 83). "I liked the first tone, but I liked the chord more" (B 113). "I liked the warmth of the thing but it was hot and I didn't like this biting quality" (B 130). "I was pretty indifferent to both. I can't say that I enjoyed the music" (B 179). "The second was U. I didn't like the colors; I didn't like it as a pictorial thing" (Di 194). "I liked the wind" (F 28). "At first I was indifferent to the odor" (G 181). "I don't like [the] . . . organ anyhow" (K 68). "I was indifferent to the whole thing" (K 188). "Somewhat painful; I didn't like it" (O 11). "An attitude 'I rather like it'" (W 132). "I found myself with the snarly facial expression that I didn't like the stuff, but there wasn't any awareness of the snarl at the time. After the second 'now' I found myself with that expression and realized that I didn't like the stuff" (W 144). "It was an 'I don't like it' attitude" (W 151).

Much rarer than the above is the form:

2. 'The object pleases me,' 'I was displeased by the object.'

"I felt pleased by the odor and very much displeased by the bristle" (B 22). "That is both P and U. I like vinegar; it pleases me" (B 91). "It hardly had a fair chance to please me because I heard the sandpaper scraping and knew what you were going to give me. This gave a little displeasure" (B 159). "At first a gentle, persuasive P; it coaxed me to be pleased" (B 168). "I don't remember that I was pleased or displeased . . . I don't like the cold water" (Di 50). "Certain parts pleased me very much and other parts were U" (H 207). "I enjoyed it and was pleased" (H 235). "I can't say that it affects me pleasantly or unpleasantly" (O 53).

The subjective type of report differs from the objective in that the former always involves the subject. Form I specifies

an attitude of the subject towards the object. Form 2 specifies the effect of the object upon the subject. Both forms are unambiguous. The objective type of report, on the other hand, is distinctly ambiguous, since it tells us nothing directly about the experience. If a subject reports 'the object was P' we, of course, can not doubt that the *meaning of pleasantness* attaches to the object. But what guarantee have we that pleasantness was *felt*? We may consider it probable that pleasantness was felt, but we never rise from probability to the relative certainty of direct report.

Analysis of Mixed Feelings. The 71 mixed feelings, without exception, are of the objective type of report[36]. The frequency and distribution of the various forms are shown in table VII. If the feelings reported as coexisting are stated in different forms, the report is entered under two columns.

The table shows that the commonest form of report is that resembling the stimulus-error (col. 2). Of the 31 abbreviations 22 are reported by subject K.

It is certainly significant that P and U are invariably objectively referred in the mixed-feeling reports. Although it is logically possible to report a mixed feeling in the form 'I liked it and at the same moment I disliked it' or 'the object pleased me and at the same time displeased me,' there is not a single case of such subjective report. Subject B, who uses the subjective type of report in nearly 50% of his records, does not even report a doubtful mixed feeling (table I).

It is logically possible, further, to report a mixed feeling without reference at all, in the form 'P and U coexisted,' 'P and U were experienced simultaneously,' 'P and U were there together.' Of the 71 mixed feelings 16 are in this form

[36]Kellogg notes a tendency to describe the object instead of feeling, but he would rather accept the "more natural form" of report than "run the risk of falsifying the results." See *op. cit.*, 60, note: "The task of the present section was so difficult that the subjects, even those of long experience, tended largely towards objective description instead of strict analysis in subjective terms. *They described the pictures instead of their own feelings.* However, in view of the interesting way in which these descriptions vary with the method of exposure, *it seemed best to allow the statements to be made in the more natural form, rather than to run the risk of falsifying the results, or getting none at all by strict insistence upon the technical form of report*" (italics ours). In his conclusion, Kellogg states that "*our results show mixed feelings only in certain of those trials in which the awareness of two stimuli was also simultaneous*" (*op. cit.*, 91). Kellogg's mixed feelings, therefore, like our own, are probably all of the objective type of report. With Johnston also (*op. cit.*, 177) the coexisting feelings are "feeling-tones, for tactual and visual impressions." Johnston's feelings, so far as we can make out, are referred to the object.

TABLE VII

FREQUENCY AND DISTRIBUTION OF THE FORMS OF STATEMENT USED IN THE REPORT OF MIXED FEELINGS

Subject	'Object was P,' 'Object was U'	'P is from object,' 'U is of object'	'P object' 'U object,	'P is object	'Object as P'	Abbreviations 'The P' 'The U'	Abbreviations 'P' 'U'
B	0	0	0	0	0	0	0
Da	1	0	1	0	0	0	0
Di	2	0	0	0	0	0	0
F	1	1	2	0	1	3	2
G	1	1	0	0	0	1	2
H	2	8	0	1	0	1	0
K	7	6	3	1	1	10	12
O	1	3	3	0	0	0	0
W	0	2	0	0	0	0	0
Totals	15	21	9	2	2	15	16

Columns 1, 2, 3, 4, 5 are not exclusive. Column 6 is exclusive of columns 1 to 5. Column 7 is exclusive of columns 1 to 6.

For the number of mixed feelings reported by every subject consult Table I.

(12 reported by K), all of which can be shown positively to be abbreviations of the objective forms. There is not a single mixed feeling of the psychological type of report. In this connection it is interesting to note that the records in the work with single stimulus contain little or no objective reference. There are no mixed feelings in this division (tables II and III).

We conclude that the group of mixed feelings as a whole is characterized by reference of P and U to the object and therefore by *statement about* the object rather than by *report of* affective experience.

Not only is P (or U) referred to the object and identified with the object, but also in many cases it is localized at the place of the object. The tendency to localize[87] the feelings is

[87]One of Wohlgemuth's subjects (F) reports 14 mixed feelings of which 10 contain localized P and U. Localized feelings are not lacking from the protocols of Kellogg. Here is an example (*op. cit.*, 77): "The pleasantness of Mona Lisa held over an instant, appearing localized near the center of the field; the unpleasantness from the wrench seemed to 'wiggle' in from the lower left corner, and when partly in, the pleasantness from the other 'exploded' and the unpleasantness spread over the whole picture." Koch records a great many localized feelings. Note also Störring's distinction between 'Empfindungslust' and 'Stimmungslust' (*Arch. f. d. ges. Psychol.*, 6, 1905, 316-32). On localization of feeling see: Titchener, E. B., *Feeling and Attention*, 1908, 43-6; for criticism of Störring, see 336-7.

quite marked in the records of H, K and F. Following are examples of localized mixed feelings:

(Odors: cinnamon, cinnamon *plus* asafoetida, asafoetida) "I got two things and it was as if one were in each nostril. On the left I got P and on the right I got U" (F 166).—(Torture, perfume) "I seemed to have both elements there. The perfume was very, very P and it was as though you felt it in the center of your body right up through the viscera. The U of the dripping water seemed to be confined more to the skeletal muscles (the outside muscles)" (H 58).—(Torture, perfume) "The P was a weak central core in the middle of me. The P did not extend below the thorax. The U was all over the body even to the feet, only it didn't get inside of me" (H 60).—(Imaginary stink, perfume) "I had a kinaesthetic experience as though I were being pulled apart . . . The pulling apart was U. It was well down in the abdomen whereas the P you seem to feel in the upper part of your chest. Both were there together" (H 67).—(Velvet plush on right cheek, sharp nail on left cheek) "U and P were there together; . . . The feelings were not located exactly at the point of the sensory experience. They were spatially on the left and right portions of my head" (K 306).—(Pressure: cotton, sharp nail) "This time they are localized. It seems to be a split of body as well as feeling. On one side feeling U seems to be localized and on the other side feeling P seems to be localized. The spatial separation happens only when P and U are of the same intensity" (K 309).—(Pressure: cotton, sharp nail) ". . . The feelings were localized in the cheeks. When they occur together they are practically of the same intensity" (K 312).

The coexistent 'object feelings' are sometimes the objects of attention. Note the following examples:

Subject K somewhat ambiguously reports that P and U are attended to. "It was a question of attention which was predominant. The P or U came according to *which one* I attended to" (K 166). "There was an undercurrent of irritation which was U because I wasn't able to give my full attention to *it*" (K171). "They (P and U) were both there and I didn't seem to attend to *both* at the same time" (K 283). "Then P and U were certainly there together. There didn't seem to be any opposition. I could attend to *both*" (K 285). "It required attention to keep the P in, but under attention *both* were there together. The U was there whether I attended or not, but when I did attend *both* were there. Attention brought the P in" (K 298).

The statement that P or U was in the background or foreground of consciousness, in the sense of attention, is fairly common. "Then there was a P but the U still seemed to be there in the background . . . The background and the P on top are there together" (F 169). "The P was either in the background or the focus all the time" (G 198). "I seem to get just a lively, little P there in the U background" (G 122). "I know that I had the bitter as a background for the sweet but I really don't know whether or not the U of the bitter was there at the same time" (W 50).

Our analysis of the 71 mixed-feeling reports has shown that they are all of the objective type. P and U are referred to the object, or attributed to the object, or identified with the object. P and U are frequently localized at the place of the ob-

ject, and are sometimes 'attended to' as one attends to a sensory object.

IV. Discussion of the Reports

The Meaning Error. In discussing the objective type of report we found it necessary to distinguish[38] between the *meaning of pleasantness* and *pleasantness felt.* This distinction is implied in the reports of the subjects, and in some cases the difference between *meaning* and *feeling* is explicitly remarked. It is, for example, clearly shown by the following:

"The ugly one gave me an incipient shrinking in the stomach like nausea. That meant U but it didn't seem to be U" (B 187). "I had visual imagery of pineapple which was a little towards P because the meaning was 'something to eat that is P' " (Da 60). "I imagined several situations that have been U in the past but the U of these situations was not repeated. The attempt to find a U situation failed and then I turned to some future situation that might be U" (Da 69). "You assume, I suppose, that honey is P, but I don't think it is in this situation" (Di 38). "The U dwindled off but the U stimulus was still there" (F 249). "I thought 'that's a U smell.' It was purely ideational" (G 232). "There was the consciousness that U ought to be there, but that consciousness never did grow into U" (K 238). "I recognized the odor as one that might be U but it was P" (O 177). "There was a sensation of warmth with anticipation that it might become U, and there was a pressure that I recognized as an experience that was supposed to be U, but the experience was neither agreeable nor disagreeable" (O 257).

Not only do the reports demand the distinction between *meaning of pleasantness* and *pleasantness felt,* but also they bear unmistakeable evidence of a confusion between *meaning* and *feeling.* This confusion is either (1) the identification of pleasant feeling with awareness of pleasant object, or (2) the inference of pleasant feeling from the awareness of an object that *has been* pleasant or that *usually is* pleasant, *i.e.,* an object that carries the meaning of pleasantness. The following reports illustrate the confusion:

"The P sensations on the margin of consciousness colored all of consciousness even though the images at the focus were U: I mean they were the same ones that before were U, but they were not U when experienced with the P" (Da 67). "Taken separately there was a strong P and a strong U but I don't know what happened. If I wasn't critical I'd say that I had both at once, but I don't think I did . . . The U was the U of the whole situation, of thwarting something I wanted to do; it was not a U stimulus. I tend to think in terms of two stimuli and say that they were both present, but the whole situation

[38] Kellogg does not explicitly draw this distinction. On the contrary he remarks that there is "a much closer relation of feeling and intellectual processes than has usually been taught. 'Feeling' and 'meaning' often seem well-nigh identical" (*op. cit.,* 89).

was U. I knew that the picture was P and I wanted to look at it, but the interference was U" (Di 241). "Then a U and the P still seemed to be in the background. I mean the thing that gave the feeling was there but it contributed no feeling of P" (F 202). "A certain amount of P and U both. I'll take it back; it was only P at the first 'now.' I wasn't entirely passive. I visualized the clamp and got interested in the cutaneous feel and I didn't notice any affection for a little bit" (B 155). "I wasn't getting any affective tone at all and then I thought 'is it U or P?' and I called it U" (G, 111). "I don't believe there was any feeling there in the second but there must have been I suppose" (K 184). "I believe I have before reported the kinaesthesis of amusement as a P feeling" (K 230). "I know I'm mixing up amusement and P" (K 248). "The second experience although sensorily U gave an amusement that was P. . . I shouldn't have said 'sensory U;' I meant it is roughness and sensory qualities which usually cause U" (K 299). "It is because I can't help seeing both things that I get the coexisting feelings" (K 264). "I was bothered at the time as to whether I was confusing the clearness of the experience with the P of it. Was it there without the P it had originally?" (W 149).

We suggest that the confusion between *meaning* and *feeling* be called the 'meaning error.'[39]

Conditions Favoring the Report of Mixed Feelings. The tendency towards intellectualization is favorable to the report of mixed feelings. Instead of reporting affective experience the subjects tend to *judge* and *decide* whether the object is or is not pleasant. Following are examples:

"It is funny how I make these judgments. I called it U because I was anxious to give my judgment so you would stop it" (Di 91). "These Ps are judgments made after the whole thing" (Di 124). "P, though I don't know. It was having to decide something" (G 51). "I don't know; I'm just puzzled. Are you allowed to give doubtful judgments in this experiment?" (K 18). "I can't decide about the second stimulus" (K 189). "The cold water was U. I don't know what else to say; I rationalized the thing" (O 41). "I decided that it wasn't strong enough either to please or displease sufficiently to forget the dropping" (O 48). "I couldn't make up my mind. It was an intellectual experience. The inability to find it agreeable was U" (O 80). "I can't say that there was a mixed feeling. It was judged from different points of view" (O 256).

The tendency towards intellectualization is shown further by the following reports. "There was on the border line of consciousness an

[39]Cf. Note 34. The terms 'stimulus error' and 'object-error' are hardly applicable to the confusion between meaning of pleasantness and pleasantness felt; 'meaning error' seems to us more appropriate.

This error is involved in the following 'dilemma' (Kellogg, *op. cit.*, 22-3): "Suppose that mixed parallel feelings are reported. The suggestion of a confusion of memory . . . may be valid as against the truth of the statements with regard to the experience during the trial. But what of the experience at the time the statements were made? The statements must have some basis. Then do we not face a choice between belief in affective imagery and belief in mixed feelings?" The memory *that* an experience was pleasant is not an affective image.

odor which I *recognized* as slightly P" (F 72). " I *knew* the picture was P and I wanted to look at it, but the interference was U" (Di 241). "It was very U before it arrived, and when it arrived *I knew* I liked it, but the other was too U to let me attend to it" (K 67). "I *apprehended* something U. I'm not sure whether the apprehension was U. It certainly wasn't P and it wasn't indifferent" (K 178). "I noted a form that I didn't like and a color that I did like. The thing came as a whole and I *cognized* the U form and the agreeable color" (O 224).

Frequently the judgment, or decision,, or apprehension is followed by common-sense explanations. "Extremely P due to two factors: it was P because I expected something P and it was also sensory P" (K 183). "U for two reasons: I expected one more note and didn't get it and that irritated me; the second element was the U jangle" (K 184). "I was pleased because I got it into my mouth" (Di 1). "That cutaneous impression wasn't P or U because I didn't know how to react to it. That seemed to be why it wasn't P or U" (Di 159). "You needn't think that it was P because I was laughing. The reason I laughed was a reflective flash of how silly it was" (K 64). "U because I needed my hands to keep the water from running down my neck" (K 65). "All those noises are U because they disturb a P equilibrium" (K 110.)

Such rationalizations merely attach the meaning of P (or U) to the object.

A second factor favorable to the report of mixed feelings is the presence of fatigue, illness, sleepiness, worry and other unpleasant moods. This fact is shown in tables VIII-A and VIII-B. We have classified the moods (recorded before every

THE RELATION OF MIXED FEELINGS TO MOOD

TABLE VIII-A

	P mood	Indifferent	U mood
Total days	50	70	50
Days on which m.f. occurred	3	17	14
Per cent days on which m.f. occurred	6	24	28

TABLE VIII-B

	P mood	Indifferent	U mood
Days on which m.f. occurred	3	17	14
Total reports on these days	26	191	142
Total m.f. on these days	4	35	32
Per cent of m.f.	15	18	22

experimental hour) under three headings. By a 'P mood' we mean the report of pleasantness, cheerfulness, energy, keen-

ness for work, etc. By a 'U mood' we mean the report of unpleasantness, fatigue, illness, sleepiness, depression, etc. By an 'Indifferent mood' we mean (1) a mood that is neither P nor U, or (2) a 'mixed mood' which contains both P and U elements in alternation. B reports a good many 'mixed moods' the components of which are never present simultaneously but always in alternation. From these tables it appears, both absolutely and relatively, that a U mood is favorable to the report of mixed feelings.

Following are a few citations from the moods on 'mixed feeling' days (Table IV):

"I have had an attack of migraine. Am indisposed and disagreeable . . . (later) This headache makes it difficult to observe" (Da 17th day, the only day this subject reports a m. f.). "My mood is dull gray. I am rather tired" (F 11th day, 3 m. f.). "Very tired" (H 14th day, the only day in the last three divisions on which there is a report of m. f.). "Deep physical and mental weariness probably due to bad headache. Inability of mind to drive body. I knew I was late to the experiment but couldn't hurry much" (K 5th day). "Too sleepy to be anything but disagreeable" (K 13th day). "My mood is subdued, not very P. Great lassitude and inactivity" (K 19th day). "Too weary to have an intense, lasting mood. The weariness itself is slightly U" (K 23rd day, 5 m. f.). "Neutral . . . (later) I don't think I introspected very carefully to-day. I have had an hour-and-a-half session with X and this was tiring" (O 18th day, 4 m. f.).

A third factor favorable to the report of mixed feelings is lack of practice and training on the part of the subjects.

At the close of the first division of the experiment we were left with the result that H had reported 10 mixed feelings (75 reports), F 3 (76 reports), G 2 (62 reports), W 2 (60 reports), K 1 (84 reports) while B, Da, Di and O had reported none (Tables II, III, IV, V). At this point in the experiment we were ready to accept coexistence as a fact. The experiment was continued (1) to increase the number of mixed feelings, (2) to see if the four subjects who reported none would eventually report them, and (3) to get reports more psychological in their form of statement. We noticed that the reports contained a good deal of *Kundgabe*, and accordingly at the start of the second division of the experiment the subjects were warned against the "stimulus-error."

This instruction to avoid the stimulus error apparently had a good deal of effect in the case of H and F. After the warning H's type of report changed suddenly from the objective to the psychological and the reports remained psychological for the rest of the experiment. With this change mixed feelings disappeared, except for a single doubtful case (14th day, mood "very tired"). With F the change from the objective to the psychological type of report was gradual. In the fourth and final section of the experiment, however, her reports are entirely psychological and here there are no mixed feelings. The disappearance of mixed feelings with the change from the commonsense to the psychological type of report is of paramount importance. It shows that lack of practice and training in affective report is a condition favorable to mixed feelings.

The effect of practice is not so marked with the other subjects. K, indeed, shows a positive decline from fairly careful objective report to brief and seemingly perfunctory statements.

A fourth factor favorable to the report of mixed feelings is suggestion.[40]

The large group of mixed feelings reported by subject K on days 17 to 24 demands a special word of explanation. K reported a single case of coexistence in the work with situations (84 reports), and not even a doubtful case in the work with single stimuli (75 reports). Yet in the two final sections of the experiment (97 *plus* 51 reports), the record for 8 successive days shows 4, 7, 3, 2, 2, 3, 5, 2 mixed feelings. Previous to this group the record of K was normal. Some new factor must have become operative about days 16 or 17.

We learned that K, in fact, at this time became (or was made) aware of the specific object of the present investigation. Here is evidence of suggestion. A quantitative study of the reports also reveals the fact that K is given more to anticipation of P and U than any other subject. Moreover, she sometimes reports "P as usual." "U of course," etc.,—phrases which indicate suggestibility. We can fairly conclude that suggestion is favorable to the report of mixed feelings.

A fifth factor favorable to the report of mixed feelings is habituation to a form of report.

We have noted that mixed feelings occur in sporadic groups extending over several days and that within the single experimental hour they tend to occur in consecutive reports. Since our stimuli were presented in haphazard combinations, approximately the same for all subjects, this group-tendency cannot be due to the achievement of specially refined external conditions such as, *e.g.*, a nice intensive balancing of stimuli. Probably it is due to the persistence of internal conditions: lack of training, suggestion, or illness. But within the single experimental hour it is difficult to see how such general conditions can account for the tendency for mixed feelings to occur in consecutive reports. This tendency, we believe, is due to the persistence of a set or determination to report in a peculiar manner. The subject becomes habituated to a given form of report.

V. Experiences Resembling Mixed Feeling

There are certain types of experience which simulate coexisting P and U and which are, in fact, sometimes reported as "mixed feelings." These types are illustrated below.

[40] Johnston, *op. cit.*, 163. "There is a great danger that the investigator will unwittingly make suggestions to the subjects by his questions. There is a great danger of auto-suggestion on the part of the subject. The likelihood is also considerable that the subjects will fall into stereotyped forms of expression and general listlessness in introspection. . . Again the special mood of the day will necessarily tend to affect all such feeling-attitudes toward slight stimulations supposed to have a feeling-tone."

1. *Rapid alternations of P and U*

"I think I should have said P-U or U-P . . . They seemed to be up and down in consciousness, first one and then the other" (G 51). "A very, very rapid fluctuation between mild U and mild P" (G 155). "The regret is what I should call a mixed feeling. I should say it was a very, very rapid fluctuation between P and U . . . You get the succession P-U-P-U (I can't say how many times) as a unitary thing" (G 198). "I seemed to get a rapid alternation between the P and the U" (H 151). "Both are there interchanging so quickly that I can't always report at the instant you say 'now.' They do not exist together but alternate" (Di 21). "Rather P. Rather U. . . I alternate right through from one to the other" (B 84). "The odor was a mixed feeling . . . I can't say that the affects were simultaneous; they may have been oscillatory" (O 145).

Alternations are sometimes correlated with respiration when odors are used as stimuli. "An alternation of P and U between respirations" (W 4). "Oscillation from P to U. It is U when I take a breath and smell the stuff and P when I exhale because the P stimulus is still there" (Di 150). "When I breathe in it is U and when I breathe out it is P" (F 192). "Every time I breathed in consciousness was U and every time I breathed out consciousness was P" (Da 206).

2. *Affective doubt.* Affective doubt is an alternation between P and U which may be expressed as an attitude 'I don't know whether I like it or not.'

"Then with the next whiff came an attitude 'I don't know whether I like it or not.' It has things in it that you like and things that you don't like. As to the course in this place it seemed that P came first and that was followed by U. I can't say whether P came again" (W 129). "I don't know whether I like it or not. A slow alternation from one to the other. One moment it is P and another moment it is U. It left me doubtful" (H 159). "I don't know whether I like it or not, in which the course of feeling was a fluctuation from P to U with the P periods somewhat longer than the U" (H 186). "That was violently P or violently U. I can't say which" (K 52). "I don't know. Rather an alternation back and forth of the feelings" (K 124). "I don't know whether the first was P or U. I guess this was probably a rapid alternation between P and U" (K 201). "A rapid alternation between P and U so I can't say which it is" (K 157).

The alternation that characterizes affective doubt may take place at a low, moderate, or high feeling intensity. K's doubt between 'violent P' and 'violent U' involved an intense U evoked by noise and an intense P evoked by amusement at the situation. The alternations left her doubtful as to whether the experience was P or U.

Intellectual doubt (so far as our data go) is U; affective doubt is both P and U. Note the following:

"Then there was a brief period of doubt and uncertainty, slightly U. The doubt was of an intellectual sort as to whether the experience

was P or U. This doubt itself was U" (H 211). "I couldn't make up my mind. It was an intellectual experience. The inability to find it agreeable was U" (O 80). "Then an attitude which meant 'I don't know whether I like it or not.' I am rather inclined to report that that was U" (W 131).

3. *Interrupted mood.* An established mood may be interrupted briefly by an affection of opposite sign. The mood may be conceived as permanent, but the reports show that there is no coexistence of P and U.

"The P was a shifting background except for two times. It was like punching a hole through it. The strokes were U and between them I went right back to where I had been" (B 161). "There is a background that seems to be my mood with these Ps and Us playing in front of it. I can't tell whether the mood breaks off suddenly (like a hole in it) or whether it is merely attentive obscurity. So far as conscious content goes it drops out under keener Ps and Us" (B 191). "It seemed as if the background of P had been there all the while although I never found the two [feelings] there together" (B 185). "P, of course, to start with. Then a hole in that P when my attention went from the candy to the [U] picture" (Di 236). "The U quickly disappears and the quiet P seems to sweep over again so that I have a background of P which seems to last over and continue after the U disappears. It is not P, though, when the U is going on, but when it comes again I think of it as a permanent thing" (G 18). "First a moderate P with just a touch or flash of U which attached to the cutaneous pain at the end of this sensory experience. It was really a shift of attention, I suppose, but it was such a rapid thing that the U seemed to be set in a background of P . . . I'm sure it was a rapid shift of attention, but when it was back in P I got the impression that it was just as if it had existed right straight through" (G 161). "There seemed to be a background of U. I was uncomfortable but the sensory experiences were both P. What happened, I know, was that while I was attending to the sensory experience I got the P, and as soon as it was gone I got the uncomfortableness, and the U would sometimes just cut across the P" (G 171). "There is a sort of background of P that seems to carry across somehow . . . The only reason I'm saying there is a background of P is because there is a memory hangover and anticipation that is P" (W 124).

4. *Meaning-feeling mixtures.* The meaning of pleasantness (which may have any one of the three time-references) may be present simultaneously with the feeling of unpleasantness, and conversely. Following are examples:

"It is U and there is the realization that P is coming in but there is no P feeling at all yet" (F 241). "The U hangs over while I am still conscious of the P stimulus" (F 246). "I knew I liked it but the other was too U to let me attend to it" (K 67). "The auditory experience was U but I realized that I could attend to the odor and then it would be P" (K 185). "Slightly U. It had a hint of P in it . . . as if it were like something that is P" (W 98). "The first was P . . . It seemed to have a suggestion of U in it" (G 151). "The

first was an agreeable feeling and as it went on there was a question whether it would remain agreeable, and there was the anticipation that it might become disagreeable" (O 76). "The taste was P but it had a hint of disagreeableness. I can't say that it was disagreeable" (O 132). "I recognized the odor as one that might be U but it was P" (O 177). "I like that despite the fact that I know I'm not supposed to" (B 111). "I like being resentful at that—P. It is a P I disapprove of" (B 132). "I enjoyed being mad at a thing like that and that was P. It seemed such a proper thing to be angry at two conflicting rhythms and the appropriateness of it pleased me" (B 166).

In many of the meaning-feeling mixtures the meaning and feeling are not present simultaneously but in some sort of alternation. Under the head of simultaneous meaning-feeling mixtures we might classify our 71 "mixed feelings," since there can be little doubt that one, or both, of the coexisting "feelings" is a meaning that attaches to an object.

Criticism of Previous Experimental Work

The experiments of Orth, Hayes, and Alechsieff yielded a negative result; no mixed feelings were reported. Since the number of reports in these investigations was small and the number of subjects few, possibly mixed feelings would have been reported had the work been extended. Kellogg remarks[41] that "Alechsieff's results only go to confirm our own." We do not see how a negative result 'confirms' a positive; but since "there were several hundred trials which gave this same result" there is certainly no contradiction between the early negative and the more recent positive results. It is probable that the subjects in the early work had had a good deal of practice in affective report before the problem of mixed feelings was attacked; at least the account of mixed-feeling experiments is given at the very close of the articles of Orth, Hayes, and Alechsieff. Since two of our subjects showed a distinct practice-effect, it is possible that the training gained in these extended investigations of feeling is a factor in the negative result.

There can be no doubt that mixed feelings are reported sporadically by certain subjects. This result confirms Johnston, Nakashima, Koch, Kellogg, and Wohlgemuth. Our stimuli include all the types used by previous investigators and our results, both quantitatively and qualitatively, are in agreement with theirs. However, we differ from Johnston and Kellogg in the interpretation of the facts. We can not accept mixed feelings as accurate reports of affective experience since an analysis shows that they involve a confusion between 'meaning of pleasantness' and 'pleasantness felt.' This confusion was discovered and reported by the subjects themselves.

Johnston[42] is concerned with other problems than mixed feeling. For example, he is interested in the description of simple feelings, the bodily accompaniments of feeling, the temporal relations of feeling-tones from simultaneous stimuli, etc. It is all the more important, then, that we be told how long the work upon mixed feelings lasted

[41]Kellogg, *op. cit.*, 91.

[42]For a criticism of Johnston's work see: Titchener, E. B., *Feeling and Attention*, 1908, 48-55.

and how many reports were given; but Johnston does not print a report or a figure. He merely states his conclusions without showing how they follow. Under these conditions we can not give a great deal of weight to his generalizations.

Kellogg's method is not adequate, although his experimental conditions are favorable to the report of "mixed feelings." In the first place, the use of picture-stimuli favors intellectualization and the meaning-error. In our experience the feelings evoked by pictures are weak when compared with those aroused by hunger, nausea, putrid odors, candy, perfume, warmth, music, etc. In the second place, rates of alternation varying from 10 to 115 per min. are not favorable to the rise of feeling. According to Nakashima[43] "the shortest time necessary for the affection to arise varies from 0.72 to 1.08 secs." This indicates that no feeling alternations can be obtained at rates above 55 to 83 per min. Kellogg[44] himself notes that feeling disappears at about these rates of alternation. Even the slowest rate (10 per min.) gives barely enough time to establish a feeling of moderate intensity. In the third place, the duration of the test was too long for accurate observation. Considering the printed exposure times as representative, we find the following distribution:

Duration of test.....	10″	20″	24″	30″	40″	45″	60″
Number of reports....	6	23	4	167	24	55	18

This gives an average duration of 34.1 secs. Our subjects complained that 20 secs. was too long, and we found 5 to 15 secs. the most satisfactory interval. Very few subjects could give an accurate report of an affective experience of any complexity lasting 60 secs.! These long exposures favor confusion of memory and hence the inference of feeling from meaning.

Kellogg claims to have found a positive correlation[45] between "(1) Tendency to parallel or mixed feelings and quickness in response," and "(2) Tendency to parallel or mixed feelings and scope of attention." To determine 'quickness in response' he increased the speed of alternation of his pictures and then decreased it again in order to determine the point at which feeling disappeared, the assumption being that the greater the affective sensitivity, the faster the rate at which the subject could obtain feeling. The number of tests was small, and they were made with both 'passive' and 'active' attitude, but despite these considerations the subjects are rated according to 'quickness in response' and a correlation of .562, P. E. .101, is worked out according to Spearman's foot-rule. In order to test this result we have resorted to the temporal records in our work with single stimuli. Our subjects were instructed "to report immediately upon the affective character of the experience." The time was taken with a stop-watch between the presentation of the stimulus and the first word of response. Although the values are not affective reaction-times, they should be sufficiently accurate for determining gross

[43]Nakashima, T., Time-relations of the Affective Processes. *Psychol. Rev.*, 16, 1909, 310.
[44]Kellogg, *op. cit.*, 83-7.
[45]Kellogg, *op. cit.*, 88.

differences in 'quickness of response.' These results are tabulated below:

Subject	K	G	F	Da	W	Di	H	B	O
Number reports	45	39	42	45	41	43	25	25	32
Av. time (secs)	3.4	3.6	4.6	4.9	5.1	5.1	5.8	7.1	10.3
M.V. time	1.0	1.4	1.4	2.4	1.8	1.8	1.7	3.8	4.3

If we consider the *number* of "mixed feelings" reported, we find the following rank order: K, H, F, O, G, Di and W, Da, B (Table I). The two series show a correlation of .43 (somewhat less than Kellogg's, but still positive) with a P. E. of .14. Our correlation is between the tendency to *report* "mixed feelings" and the tendency to respond quickly. If, however, we group the subjects according to type (as regards the report of "mixed feelings") the result is very different. Five subjects—B, Da, Di, G, W—report no unequivocal "mixed feelings" and belong to a single group. Two subjects—H, F—at first report "mixed feelings," but show a practice-curve. Two subjects—K, O—report "mixed feelings" and show no practice-effect. K and O belong to the same group as regards the tendency to report "mixed feelings," but K's responses are the quickest and O's the slowest! We believe that K's quick responses are offhand reports, while O's slow responses are reflective judgments. Both types[46] of response are favorable to the report of "mixed feelings." As regards the second correlation, "scope of attention" was not measured by us. Kellogg's subjects were asked to do mental arithmetic while the rate of alternation of the pictures was being gradually increased and decreased, and to report when feeling disappeared. The assumption underlying the method is that the ability to do mental arithmetic and to obtain feelings from rapidly alternating pictures indicates "scope of attention." Kellogg, however, notes[47] that the results "are not very satisfactory, owing to the fact that the adding soon gets mechanized, and also that some of the subjects add visually, so that interference of an unwelcome sort came in. Still, though two series are hardly a sufficient basis for generalization, the results seem to indicate that distraction has less inhibitory effect with those subjects who have the stronger tendency to mixed feelings." If range of attention were accurately measured, we should probably find a constant: but a measure of attention that is to be correlated with tendency to report "mixed feelings" should not involve the feeling factor!

Kellogg introduces his concluding section by the statement that "The 'law of algebraic summation' of feelings is quite inadequate to account for the results obtained . . . Simple algebraic summation is only occasional. Displeasure may inhibit displeasure, rather than add to it." Our unpublished results with controlled attention, so far as they go, seem to indicate that two simultaneous stimuli to U, or to P, may result in indifference. The matter demands further investigation.

[46]There is perhaps a sex difference. The 3 women subjects are quicker in response than the 7 men, and Nakashima found a shorter affective reaction time for women than for men. (*Am. Jour. of Psychol.*, 20, 1909, 191).

[47]Kellogg, *op. cit.*, 86.

Kellogg's further conclusion that "mixed feelings" occur when the 'apperceptive attitudes' are similar does not follow from his results, or at least we are not shown how it follows. There is no mention of a measure of similarity of attitude. There is, further, a confusion between (*a*) similarity of stimulus-object and (*b*) similarity of attitude.

CONCLUSIONS

1. Pleasantness and unpleasantness are not felt at the same time. So-called "mixed feelings" involve the awareness of an object to which the meaning of pleasantness, or unpleasantness, is attached. This "object-feeling" may be localized and attended to.

2. Our results compel a distinction between the meaning of pleasantness (or unpleasantness) and pleasantness (or unpleasantness) felt. "Mixed feelings" involve a confusion between the meaning of pleasantness (or unpleasantness), which is referred to an object, and affective experience. This confusion, which the subjects themselves remark, we have called the *meaning-error*. The meaning-error is favored by (1) intellectualization, (2) unpleasant mood as fatigue, illness, sleepiness, worry, etc., (3) lack of practice and training in psychological report, (4) suggestion, and (5) habituation to a form of report.

3. "Mixed feelings" are reported rarely and in sporadic groups throughout the course of the experiment and the single experimental hour. The subjects show marked individual differences in the tendency to report "mixed feelings." Five of the nine subjects report no unequivocal "mixed feelings;" one does not even report a doubtful case; another reports more than half of the total number. Of the reports of "mixed feeling" more than a third contain some expression of doubt and uncertainty.

4. There are four types of normal experience resembling "mixed feeling:" (1) rapid alternations of pleasantness and unpleasantness, (2) affective doubt, (3) the brief interruption of an established mood which is conceived as permanent, and (4) the awareness of a pleasant object while one feels displeased, or the awareness of an unpleasant object while one feels pleased.

THE HUMAN MIND

A Suggestion as to the Constitution of Normal, Subnormal and Supernormal Mind

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In this discussion of the constitution of human mind no arrogant assertions are set forth; it is, merely, that the writer wishes to indicate what appears to him to have been the phylogenetic course in the development of mind. Following the discussion we shall discover that an understanding of the process will lead to, not only an understanding of normal mind, but, also, of subnormal mind and of supernormal mind. We shall discover, in fact, that these phases of mind correspond very closely to the three major divisions of time. That is, that normal mind appears as Present; subnormal mind as Past; and supernormal mind as Future.

I

Involved in any discussion of the human mind is the answer to that ever-recurring question, What is mind? for there can be no intelligent discussion of mind until this question is answered. And, so, we find ourselves confronted by this question here, at the very beginning of our discussion. *What is mind?* From whence does mind proceed? Is it spiritual or material? Supernatural or natural? Is it an emanation or an expression? And how shall we reply to the question here presented, for, there is but one, after all. Examining the question carefully, we find that it is far from being an easy one to answer. It becomes in fact, very subtle and far-reaching, for, we find, that any answer that we may give to it, only suggests another question.

For instance, if we affirm that mind is a spiritual emanation, is supernatural, the query comes back, first, What is a spiritual emanation? and, second, Where does the supernatural lie? Or, if it be affirmed further that mind is a natural manifestation, an expression of organic action, again are we beset by questions. How does the natural differ from the supernatural? And, if the reaction is organic, does it pro-

ceed through a single organ? or, are all the organs involved? And these questions, as may be seen, open up a discussion in which the further questions fly thick and fast.

The difficulties of the original question now become apparent. Mind may not be described offhand by a word or two; it is a many-angled complex, and its description must embrace *all* the angles. Mind is, in my view, an organic complex in which the manifestation is through a single organ. We approach that organ through the following formula. Mind is consciousness; consciousness is recognition; recognition is memory; and memory is that faculty of the cerebral cells by means of which past experience may be recalled: In the ultimate analysis, then, mind appears as conscious memory, as memory *plus* consciousness, *as memory directed by consciousness.* Memory without consciousness would not be mind; it would be merely reflex action, merely memory revived through the reflex. All living cells have this reflex memory, but conscious memory is visible in only a certain few. Through reflex memory the cell knows what to do when an external stimulus tells it what to do; but the stimulus always is external to the cell itself. The cell possessing conscious memory, on the other hand, being self-directing, can originate an impulse. While an external stimulus can call it into action, it does not require the external stimulus.

The distinction here is a rather fine one. The situation suggests the question: If mind embraces recognition why is not reflex action mind? In the reflex there *is* recognition, else there could not be response. But there are two characteristics of the reflex that keep it always a reflex: It is inflexible, that is, the reaction is always the same; and, there is no recognition of the act after the reaction has been completed. In the reflex arc there is no true consciousness, there is only reflex recognition, just a quick, evanescent flash that leaves no conscious memory in its wake. In the thought cells of the cerebrum the reaction is different, is more complicated. We may have here this same reflex action, just reflex recognition; but we may have, also, true consciousness. Consciousness may oversee the reaction: it may receive the incoming stimulus, consider it, and return an answer or not, as it sees fit. The thought reaction is flexible where the reflex is inflexible; it has the slower, *directed* movement of real thought, while the other has the quicker, *limited,* movement of unthought. In thought the memory of the reaction remains in consciousness; in the reflex it does not.

I have said that mind is an organic complex in which the

manifestation is through a single organ; and we discovered that organ through our formula, for, having reached to the cerebral cells through it, we find ourselves within the brain itself. But now, the brain is not the only organ involved. All the organs of the body, in the degree in which they have to do with the well-being of the brain, support the reaction. All the organs are involved, but the brain is the organ of manifestation. Accepting this as a basis from which to proceed we find ourselves better able to go on with our examination into the constitution of mind. We now have reached a center from which our research may extend in all directions. Heretofore mind has been looked upon as something above brain, as something emanating from above the human plane; but now we perceive that, while the manifestation often does seem to be above the brain level, its origin actually is at that level.

The closer we examine mind as a manifestation of brain the more are we impressed by the fact that the brain is the basis of mind. Not that the cerebral cells *are* mind; they only are the basis of mind. If they were mind nothing more need be said, for the answer to the question What is mind? would then be obvious. The cerebral cell then would possess the power of supreme consciousness. But the cerebral cell does not possess that power, *not yet,* and hence the difficulty it has in understanding itself. That that is the goal toward which the cell is reaching becomes more and more apparent the deeper we go into brain history; it becomes apparent, also, that the cell still has some distance to go before it attains its goal.

And so, if we would understand mind we must understand brain; and so, if we are seeking a clear understanding of brain function, we must know something of brain history, and something of brain structure. Here history and structure go hand in hand, for, the story of brain structure is the story of brain development. This story has its beginning in the remotest of remote antiquity. So remote is it, in fact, that we have no direct knowledge as to it, such items as come to us being, as it were, but echoes that have grown faint through distance. But, as echoes, however faint, must have an origin in fact, so here, these echoes hark back to something more substantial than themselves. Advancing knowledge has enabled man to locate these echoes and to begin their classification; but it is only a beginning, for the problem is intricate and difficult, and is to be solved only through laborious effort, step by step. The echoes are not long graceful arcs revealing direct pathways between cause and effect. They are a series of short arcs mingled in apparent confusion extending in a long chain

between the remote point and the near. The difficulty here lies in tracing the proper connection between these intermediate points, in discovering the orderly sequence of the links of the chain. But already some of these points have been connected up, and now we are beginning to catch an idea as to the origin of the human brain. It is becoming more and more apparent that the human brain as we know it is but the present manifestation of a long process of evolution; that the human brain of today is but a sublimated animal brain. Among the several items already known that mark this fact, and which are, to my mind, conclusive, are the following. First. The test known as Nutting's biological blood test, as given in Vol. lxix, No. 453, of the "Proceedings of the Royal Society of London." Second. The remarkable resemblance, both macroscopically and microscopically, between the brain of man and the brain of the monkey, as revealed by the researches of a number of highly trained observers, and, especially by the exhaustive work of Dr. A. W. Campbell, of the Royal Society of London, as set forth in his book, "The Localization of Cerebral Function." Third. The obvious dominance of the animal (motor) brain in the developing brain of the child, and in the congenitally arrested brain in the feebleminded. The first item reveals the close blood relationship between man and monkey; the second and third, their close brain relationship. Let us look into this a little more closely.

For the blood test Nutting prepares an antiserum by injecting human blood, intraperitoneally, into a live rabbit, one injection following another at intervals of three or four days until three or four injections have been made. The animal is then bled to death, and the anti-serum made from its blood. This serum added to dilute human blood causes a characteristic precipitate. Nutting has performed this test upon all known varieties of the vertebrates and has obtained the reaction in the bloods of but two: man and monkey. An interesting point here is that the blood of the old-world monkey gives a stronger reaction than does the blood of the new-world monkey. Nutting finds, also, that the bloods of different groups of animals tested by an anti-serum made from the blood of one of the group give a characteristic group reaction.

Campbell's researches have revealed a very suggestive similarity between the brain of the man and the brain of the chimpanzee. He finds the cellular and the fibre structure of the cerebral centres in the man brain practically duplicated in the chimpanzee brain, the difference between the two being, mainly, one of degree. The chimpanzee brain, mainly an animal

brain one-third the size of the man brain, has neither the area nor the development of the other. The man brain is a thought brain, but, in the chimpanzee, the motor (reflex) centres dominate. The activities of the chimpanzee follow through the motor centres, and these centres occupy a relatively greater area in its brain.

A report by Leyton and Sherrington in the Quarterly Journal of Experimental Physiology (Vol. XI, No. 2), on some experiments in cerebral localization upon anthropoid apes adds a further bit of evidence in favor of the contention that the ape brain and the man brain are closely related. The evidence is as follows: That the outlines of the motor area, as mapped out by Leyton and Sherrington, follow very closely the histological outlines of Campbell; that the motor responses induced by faradization of the anthropoid brain are very varied, approaching the movements of man in number; and that these movements are far more than those obtained from the dog or macaque.

Does the chimpanzee, or other anthropoid, think? That is a difficult question, but histology offers a suggestion toward an answer. The area in the chimpanzee brain corresponding to the so-called thought area in the man brain has the same cellular structure. The cells carry the same characteristics and follow the same arrangement, but they are fewer in number and lack in development; this "thought" area in the chimpanzee, while it is present, is very primitive. While brain cells are able to make themselves manifest, no brain cell can give a manifestation beyond the power of its own structure *and* development.

The point of greatest insistence in the animal (chimpanzee) brain is the predominance of the reflex, the predominance of the motor area. The actions of the animal *are* reflex. That is, his brain acts only in response to external stimuli. It is not a thought brain, it is an impulse brain; a reflex brain that seems to be capable of responding only when a stimulus is sent in to it. It cannot originate, it cannot think for itself, for this brain has not reached the stage of development where that becomes possible. Its thought cells have not come into consciousness, they haven't conscious memory; they do not *consciously* receive and record impressions. It is possible that they do receive impressions, but, if they do, that is as far as the reaction passes. At that point there is a hiatus; the impressions are received but not considered. There are two reasons for this. First: the animal hasn't language; and, second, as we have seen, he hasn't conscious mem-

ory. Memory in these cells is, as yet, entirely reflex; they can recognize an impulse, but they cannot, without the impulse, recall past experience. When a sensory impulse is received by this brain, one of two things happens. Either it returns an immediate reply, or, no reply at all is returned; it is reflex or nothing. This brain being a reflex (motor) brain, there can be no visible reply except through the motor apparatus. That is not to say, however, that, lacking the motor reply, there is no effect following the reception of the sensory impulse. That would be an impossibility. All stimuli *entering* the cortical cells, whether in the brute brain or in the man brain, leave some effect, however slight it may be. The effect may not be visible as a direct manifestation, but the effect remains as a permanent impression upon the cells, and, if it be repeated sufficiently often, it may, eventually, come into consciousness. In that event it becomes a part of the evolutionary process, for, it is increasing the power of the local area in the cerebral cortex; it is developing conscious memory therein. Following this argument it becomes more and more apparent that the man brain has developed through the brute brain; and we confirm the argument through the study of the child brain and the brain of the feebleminded.

The combination of conscious memory and the higher centres has come from two directions: directly, through the reflex, and, indirectly, through muscular action. The entire process, then, may be traced to the effect of environment upon the individual; an environment ever-changing, persistent, at times almost overwhelming.

The pre-man was an individual of action, and, beginning man, being the immediate continuation of the other, possessed his characteristics. These two *animals* were nothing more than reflex automata, in whom the reflex arc was made up of environment, brain and muscle. Environment sent the message, the brain received it, and the muscles gave back the answer. In the reaction the brain was a passive agent; it did not direct the movements, it merely synchronized them. It could not direct, for it was a nonconscious organ, and was not aware of what was going on within its own confines. The movements of these primitive beings were the *quick*, impulsive movements of wild animals, not the slower, directed movements of man; they were nonconscious movements, not conscious. But the nonconscious were the forerunners of the conscious.

In these movements of the pre-man, and of his immediate descendant, the two sides of the body participated equally; they were not differentiated as they are in the man today. All

the movements were synchronized, and the two sides acted together as a whole. Not that the animal was ambidextrous. He was neither right-sided nor left-sided; *he was undextrous.* He used either side with equal facility; and, as a rule, he used both sides together. His radius of action, therefore, was limited; being reflex it was inflexible.

This may be observed today. Watch the monkeys at any Zoo. In using the hands in any ordinary capacity, to pick fleas, to scratch themselves, or to reach for anything, they use one hand as easily as the other. If they are suddenly startled they turn like a flash and jump for the side of the cage farthest from the noise, clutching it with all four extremities at once; or, if for the perch, by both hands simultaneously, not glancing toward the seat of supposed danger until they are over the first alarm. Their actions are typically reflex; they are spontaneous, quick, *undirected* muscular coordinations.

But now, as time goes on, the difference between the pre-man and man becomes wider and wider; the behavior of the animal is changing more and more, this change being due mainly to a wider use of his fore extremities. The animal now is using these extremities as hands, and, what is more to the point, as differentiated hands. Changes in his environment have placed before him increasingly difficult problems, the solving of which demanded two things: dexterity and thought. Under the new conditions he was forced to adopt different measures to preserve his own life. Where before life had been easy, now he actually had to work for a living, *to work with his hands.* And in the process the two hands became differentiated; that is, each hand approached its tasks from a different angle; they no longer were one in their actions, they were individualized. And this new hand work created new brain centres; for as the hands developed new uses, the brain followed that development. The body and the brain developed together, for the two are one and inseparable. And, so, out of the pre-man and primitive man came man, *thought man;* but he was, even then, little better than his ancestors. He was still more animal than man, an animal in whom the grosser attributes of the brute were still the dominant attributes; being the older part, and consequently the better developed, they actually were him. His brain was not yet in that state of development that gave to it the power to recognize values; the animal had not yet come into real consciousness. In fact, the degree of consciousness was very small; but the change had begun, and it was not to stop. Man had taken hold of the brute, and nothing could shake him off.

I have said that it was environment that developed man; and now I say that it was the fear of environment that developed him. Analyzing the environment of primitive man we find that that actually was so; we find that fear was the urge that impelled him forward, that impelled him to use his hands. Fear beset man upon every side; the fear of wild beasts, the fear of his stronger fellows, the fear of starvation, and the fear of the elements; literally, the fear of environment. It was this fear that begat thought. The man had to think in order to win against his environment. Mere reflex action was not now enough; thoughtless action, no matter how quick, could not avoid the new dangers; it now became necessary to understand the danger and to plan ahead of it, *it now became necessary to think.* The association of ideas brought about through the fear reaction was creating a thought reaction. This was, of course, a weak reaction in the beginning, it was little more than a complementary impulse following in the wake of a stronger impulse; but it *was* a beginning, and, as time went on, it gathered unto itself greater and greater power. And, as the power for thought increased, the motor reflex slowed down; the quickness of the animal gave place to the deliberative effort of the man.

The primitive brain had for active centres only those having control of the special senses, and those in the so-called motor area; the primitive brain was, almost wholly, a motor brain, as we have seen. Outside of the regions given over to the five senses, the regions of the brain concerned in the motor reactions were those convolutions in immediate relation to the great central fissure, the precentral and the postcentral convolutions. And these areas remained the solely active areas until the brute began to give place to the man. Then, in response to the new movements called forth by the new conditions, new areas came into activity. These new movements while proceeding through the primitive motor region, carried the brain effort beyond that. The new movements were different from the old, were finer, requiring a differentiation in muscular action and a new coordination in the actions of the individual muscles. This was, in fact, the individualization of the muscles themselves. And for this the old automatic centres would no longer suffice, for automatism could not direct; automatism was nothing more than reflex action. The new movements called into play a new force, a directing force, a force to which we give the name *thought.* Thought made possible the coordination and the slower and the finer actions of the muscles. Take, for instance, the development of writing. The beginning of writing was

in the drawing of straight lines and the approximation of one line to another. To the hand without a mind behind it the straight line is next to an impossibility, and the even joining of two lines an actual impossibility. But the *man in the brute* did accomplish these tasks; and then it became comparatively easy to proceed to the making of a square and a circle; and, after these it was but a step to picture writing, and a further step to the writing with letters.

This development was progressive, covering, no one knows how many thousands of years. It called into action, first, the old muscle centres in the precentral region, then a new centre in the convolutions closely adjacent to the first, and, third, another new centre in the convolutions anterior to the last. And these were not independent centres, isolated from the others; these centres were linked one with the other through the association fibres. Through these fibres the actions of the centres were synchronized. There is here what appears to be a regularly advancing developmental process. New areas come into development to receive and to direct the new sensory stimuli coming into the brain; but the new areas did not spring into existence spontaneously, not all of them together, at the same moment. This process of brain development was a slow one, covering a vast period of time, for there were many centres to be brought into function through the development of new cells and fibres. There were too many complexities to be worked out.

We are beginning to grasp the meaning and the method of brain development in the study of the developing brain, and in the study of comparative brain anatomy. As we have seen, the structural likeness between the man brain and the chimpanzee brain is very suggestive; the difference between them being mainly differences of degree. And study of the developing brain reveals how the various centres have come into action one after the other. Through this we learn that the cells in the centre for smell in the lobus pyraformis are the first to develop, and its fibres the first to become sheathed; and that the sensori-motor areas are the next. But we learn here, too, that, while the smell centre is the first to begin, the sensori-motor centres fast outstrip it. Then follow, in successive order, sight and hearing. It is only after the completion of these primitive centres that the intellectual areas develop. It becomes obvious, then, that the order of the brain is, first, primitive brain and, then, modern brain: first, reflex brain, then, thought brain; first brute, then, man.

The brain now has passed beyond the primitive stage. It

is not now an organ in which an incoming stimulus merely excites an automatic reply; it is a brain in which the stimulus is received, *considered,* and a reply, or no reply, is given, as the *reason* of the individual directs. Theoretically this gives to man the ideal brain.

But now, there is a conflict here. This ideal brain is not ideal; its judgments are not always the judgments to be looked for. Its action is not yet well balanced; all of its centres are not equally efficient, the irregularity being due to an unequal development. That is, the age of the various centres varies. For instance, the centres in the precentral convolution are the oldest of the centres, those in the immediately adjacent centres are the next oldest, and those in the area before the last are the youngest. In other words, reflex muscle-action is first, special muscle-action is next, and directed muscle-action last.

And there lies the conflict. Reflex action, impulse action, dominates the brain. It has become a habit-action; and habit-action is master-action. Thought-action has two weaknesses; its period of development has been a short one; and, it has followed the pattern of its parent, the older reflex. *These weaknesses are very strong ones,* for it is these *weaknesses* that dominate the thought function. Thought having developed through the reflex remains only reflex thought. There is here a grave defect, for, it means that, when a sensory impulse demanding thought enters the cerebral cortex, the response comes back through a reflex arc. There is no real thought attached, only a reaction along the easiest way; it is just loose reflex action. This leads often to a bizarre and disjointed thought effect, for, the thought images nearest in line are the ones most apt to respond to the impulse. This is not real thought, for there is no control of the response, no directing of the thought images into logical lines. Thought is as yet too weak to direct. The response will be according to the experience of the individual, according to his past. This means, in the ultimate, that reflex thought is merely an expression of the past. True thought is this, too; but, on the other hand, true thought is greater than this; true thought is more than just loose reflex action. True thought is *direction,* is the power to direct; it is self-consciousness directing the response. It is the man brain directing the brute brain: it is the Present directing the Past. In the last analysis, then, it *is* the Present, for the man epoch is the present epoch of the brain. It will not be difficult to understand from this how the Past, being older and stronger than the Present, will dominate the Present; how the reflex will dominate thought.

Mind, then, becomes a reaction between Past and Present. In this reaction there are many variations of degree leading to the different phases of mind; but in the normal mind the reaction must be equable. The present must counterbalance the past. On the contrary, if the past dominates, if the Past excludes the present, we have subnormal mind; or, if the present becomes the dominant power, we have exhibited the phase known as supernormal.

I have said that in subnormal mind the past excludes the present. Just what does that mean? How can the *present* be excluded? Actually, of course, the present may not be excluded, for, the present is all there is to life; the present closely surrounds us, environmental stimuli prick us upon all sides. But in the subnormal mind there is little or no response to the stimuli, the degree depending upon the developmental period of the brain behind the subnormal mind. Subnormal mind is the manifestation of subnormal brain, and proceeds from one of two directions: the fault may be one of structure, or one of function. Either the brain structures have not attained to a full growth, or, while they are complete structurally, they may not be functionating to their full capacity. In the latter, function may be restored, or, rather, brought out; while in the former there can be no mind manifestation beyond the period represented by the developmental stage. It becomes obvious, here, that the one form is not feeblemindedness at all, for, if function may be restored, then the error is merely functional and not due to faults of growth. True feeblemindedness, on the other hand, proceeds through a brain that is incomplete structurally; and, as it is the stage of brain development that determines the capacity of the mind, nothing can force the mind to an effort greater than the power of the brain behind it. In the congenitally feebleminded the degree of mind impairment is the degree of brain lack. The brain lacks the power to respond to environmental stimuli, in fact, it might be said that a feebleminded person is a person out of contact with his environment. It is doubtful whether the feebleminded possess mind at all. Their mental reactions seem to be entirely reflex. They can do with their hands, but they cannot do with their heads; they can use their muscles, but they cannot use their brains. Their brains have been arrested in development, and, as this arrest has occurred before the brain has attained the man stage, its manifestation obviously cannot reach up to the man. But there is an attempt to reach up, the man cannot be entirely excluded, and the manifestation becomes, therefore, a mixed one, but, with the balance vastly in favor of the ani-

mal. The intelligence of the individual does not extend, in fact, beyond the intelligence of the animal. And, as the animal represents a past stage in the development of man, it must follow that the reactions of a brain in this stage of development can represent only the past. We have, then, to do with a brain that is out of touch with its environment, and dependent upon the past for its reactions; we have to do with a brain that has *structure* memory and not *conscious* memory. There is a brain, but the individual is no more conscious of it than he is of his other internal organs.

The feebleminded individual, then, has no value beyond his own manifestation, a manifestation almost entirely of structure. The brain being the product of a million years, more or less, of slow effort, has had those million years woven into its structure. In the man, therefore, where the growth of the brain has been arrested, where there is no man consciousness to control its action, the action is going to proceed through those million years; that is, it is the structure built up by those slow-moving years that will give the trend to that brain. The action will be structure action, inflexible reflex action, not free, limitless thought action. The past manifests itself through that which it has reared; the present being excluded from participation in the manifestation.

But now, there are different degrees of feeblemindedness; the exclusion of the present is in varying degree. There is the idiot, the imbecile, the moron: an ascending scale of feeblemindedness. We have, in these ascending phases of mind, two things to consider: the influence of the dominant animal brain, and the influence of the latent man brain. While the past does dominate, there is an inward urge, a reaching out; there is the man effort exhibited in the attempt to pick up the stimuli of the encompassing environment. But this reaching out never gets beyond the stage in which the brain is set; the reach is never greater than the ability to reach. The reaction to environment is never greater than the ability of the brain to react.

In the lowest of these degrees of feeblemindedness, the idiot, the individual may be said to be out of contact, out of conscious contact, with his environment; the brain-lack is more or less complete, varying from nothing to nothing plus. Where the brain-lack is complete we have, merely, a somatic animal, a feeding animal, not a brain animal; the individual is merely a collection of sustaining organs. In the attempt to study idiots of this degree we are baffled; not being conscious of their environment they cannot intelligently respond to it. We can

make no more of an impression upon them than we can upon wild animals. Their behavior is very animal-like. In some the disposition is mild, in some ugly; they make guttural sounds; they "bolt" their food, sometimes holding food or saliva in the mouth. If we speak to an idiot of this grade he gives no sign of understanding. In fact, he pays not the slightest attention to us, no more than if he did not hear. And he does not hear, that is, he does not hear the words, he does not understand words: not possessing language he cannot understand. He behaves as would any animal under like circumstances; he behaves as would any dumb brute who possesses neither language nor reason. On the other hand, an idiot of higher grade, one whose brain lack is lesser, is capable of making some response. This one, too, is unable to speak a single word, but he can understand, to a very limited extent, what is said to him. He comes when he is called; if we offer to shake hands with him he timidly places the fingers of one hand in ours; he even can make marks with a pencil upon paper, but the lines are meaningless, crossing and recrossing one another aimlessly.

What marks the difference between these two types? Is it not that in the second case, the idiot of high grade, there has been some *conscious* contact with environment? As a baby he was fondled and talked to, as all babies are; and his cortical cells were able to receive these stimuli, and to respond to them, up to a certain point. He thus received some training in the essentials of the man-brain up to the time when his brain ceased further to register impressions. But whatever that brain has learned, little as it may be, remains within its memory, remains as the merest rudiments of intelligence; and being rudiments they are reproduced as rudiments. It is characteristic of the brain, especially of a brain in the very beginning stage of development, that it reproduces as it has learned.

The idiot is an anachronism; he is an individual with his dates badly mixed; he belonged upon this earth half a million years ago. He exists in the past tense; he is the animal in whom the human manifestation is in the very beginning stage. The fact that the high grade idiot can understand some words, but not repeat them, proves one very obvious law of brain development: that sensory stimuli are recognized long before the brain is able to reply to them. This is, in very truth, the fundamental fact of development of cerebral cortex, as suggested by the researches of Flechsig and others on the myelination of the nerve fibres of the brain. Through these researches it has been discovered that the sensory fibres acquire

their sheaths before the other fibres, the motor fibres being second, and the association fibres last. It is a matter of common observation that, in developing function in the brain centres, it is necessary to send the developing sensory stimuli into the centres many times before they take on the function; it is necessary to put the centres through this training before they are able to act for themselves. It seems to be necessary that the centres receive this stimulation before their outgoing fibres, both motor and association, can come into usefulness.

Coming to the imbecile we reach another stage in the development of language: the imbecile not only understands words, but he also can repeat them: but he can understand many more than he can repeat. He has a vocabulary ranging from a very few words to several hundred, the number depending upon the degree of his imbecility. The words that he can repeat are those best suited to his immature brain; they are short words of one syllable, or, words of two syllables in which the two are easily pronounced, or, are similar, such as "papa" and "mama." With the words at his command he even can form short sentences; but in any of his uses of his words he is very uncertain. He does not always sound them correctly; he does not always put them together correctly; he does not always use them with good sense. Words are for him little more than bare sounds; they suggest little or nothing to his mind. In order to have any significance at all there must be an image that identifies the word in his mind. Mama is such a word; the image of the mother always accompanies it. As a baby the individual heard it constantly from his mother's lips; the word and the object were closely associated in the baby's mind. This constant association and this constant repetition indelibly impressed the word upon the baby brain cells. The baby learned the meaning of the word and how to use it; and even though the baby brain never developed beyond the baby stage, that which the brain had learned remained as an integral part of it. And, further, the imbecile can understand longer words than those he can utter; he can understand longer sentences than those he can repeat. This we should expect, knowing the manner of the development of the sensory fibres of the human brain. As in the high grade idiot we find the brain reaching out beyond its limit; it can receive far beyond its capacity to manifest. It is this reaching out, this ability to receive, that represents the human side of the brain; it is the backward pull, the inability to respond to the incoming stimuli, that represents the animal side.

And, as the imbecile differs from the idiot, in the matter of language, so does he differ from him in the matter of behavior. The ability to identify objects and to repeat the words representing them has given to him a wider horizon. His behavior is still the behavior of the animal, but the human touch, *the saving grace,* is now in evidence. Self-direction is now beginning to appear; the individual recognizes himself and his surroundings; his environment is making itself manifest. The reactions within the brain cells are coming into consciousness, but the consciousness here is only a beginning consciousness. It is unstable; one moment manifesting itself and the next seeming to fade away. This should not disturb us, for it is characteristic of brain development. That which seeks to establish itself in the human brain accomplishes its purpose through only laborious and uncertain effort.

As we proceed upward through the different degrees of feeblemindedness we appreciate this more and more. More and more are the human attributes in evidence; but there is still that uncertainty of action. Consciousness has, indeed, a difficult path to travel. The reaction within these brains is, after all, more that of the reflex than that of real consciousness, of real thought. It is a touch-and-go consciousness, a momentary flash that but accentuates the blankness that follows in its wake. As the degree of feeblemindedness lessens, the command of language increases. The vocabulary enlarges. Words take on real meanings; they become more flexible and are woven into longer and longer sentences. One sentence is followed by another and another; the individual can carry on a sustained conversation in which there is a logical argument; thought has become real to him. And his behavior level is rising also. His movements are becoming better coordinated, and his brain centres are acting in closer accord. In fact, the brain is taking command of the individual; thought is directing his activities. No longer do his muscles lead him into aimless contortions; no longer does he do ridiculous things with his person. The individual is now beginning to recognize himself; now makes the effort to control and to regulate his actions.

What is the one characteristic that marks the difference between the feeble mind and the strong mind? It is language, is it not? It is the same attribute that differentiates the man from the brute. Language is a man acquisition; through language man has completely isolated himself from the brute. If language were eliminated from the feebleminded, that is, the cortical centre for language, those unfortunate individuals

would lose their human characteristics and become actual animals. And that is what almost happens in the lower grades of feeblemindedness. Language gives fluidity to thought. It is possible to think without the use of words. But, without words, it is impossible to give expression to thought. This does not apply to the individual who, while in the full exercise of the power of speech, suddenly loses it; it has reference only to the individual, man or animal, who is born without language.

Leaving, now, the subnormal, let us consider the normal: the normal human brain. The beginning manifestations of the normal human brain, as we observe them in the infant and in the child, are very similar to the manifestations of the subnormal brain in the feebleminded. The two hark back to the very beginnings of the human race; the brain of the child represents the early stages of the racial brain. The brain of the child is a motor brain, a brain of action, of reflex action, in which the thought faculty is just beginning to assert itself; it is the brain in which the animal and the man are commingled, but with the animal attributes in control. We should expect, then, that the manifestations of such a brain would be the manifestations of the period represented by its development; and so we find them. The animal attributes are in the ascendency, while the higher faculties are in the primitive stage: thought, reason, speech and language are very imperfect. The reason for this will be easy to grasp if we understand the phylogenesis of man.

The life of man upon the earth may be divided into two periods: the ante-natal and the post-natal. The ante-natal period embraces a million years, more or less, and is the period of development of the merely animal brain, *the foundation of the man brain;* The post-natal period embraces the years that have gone into the development of the actual man brain from the animal brain. In the latter are included all the thousands of years between the present-day man and beginning man, as well as the few years of actual earth existence of the individual after his birth. Within these periods the man brain has developed; so, that, it is not at all surprising to find, in the brain of the individual, manifestations of the two periods, working side by side.

But, while these manifestations are working side by side, they are not working in harmony. It is true that, in the beginning, the animal attributes hold the advantage, but they find it more and more difficult to keep that advantage. The man attributes are there constantly endeavoring to obtain the mastery; but, being younger in point of development than the

others, they are handicapped, they have to fight to maintain a foothold. But theirs is a battle of time. If they are not able to win all at once, they are content with the mere foothold, knowing that, once the foothold is secure, it cannot be displaced. The placing of one foot leads to the advancement of the other; and so, step by step, with eternal patience, is their progress made. The animal attributes gradually are pressed back; but their retirement is attended by violent efforts at maintaining their positions. And it is this very violence that keeps them so much in evidence. Their manifestations are unequal, uncouth, explosive; they are merely undirected, reflex outbursts.

It is the influence of the higher faculties that is going to equalise the animal manifestations, that is going to refine them, that is going to tone them down. Impulsive reflex action is going to give place to deliberative action, to directed action; mind is going to rule, not brain. The Present is going to direct, not the Past. The individual is going to supervise his own brain development; he is going to learn how to put ideas into his brain to his own best advantage. The sensory stimuli are going to be received intelligently and assigned to their proper places. Out of instability is to come stability; out of disorder, order.

But the Present must not be allowed to overdirect; the individual must not be allowed to become supernormal; too much emphasis must not be put upon the brain during its developmental period. The supernormal brain is a brain in which the congenital development of the cerebral structures is advanced beyond the normal period. It is one in which self-consciousness develops too early, in which the reach is beyond the present; the supernormal is a projection into the future. There is a supernormal development of the brain structures, through which the brain centres become abnormally responsive to sensory stimuli. The incoming stimuli are picked up with avidity and thought is excited without effort. The mechanism approaches perfection in its action; the brain cells are ready, and eager, for work; the association fibres have taken on premature activity and are ready for the transmission of correlating impulses between the centres; the motor fibres, in alignment with the others, transmit the outgoing impulses without hesitancy and without error. This brain, acting in the present, is acting only as a future brain can act.

But all this is not so well as it appears; perfection has arrived too early. Brain development must not be pushed beyond normal limits; *the centres of the human brain must not*

be put under forced development. Normal development is slow development. The normal brain is not born already developed; *it is born to be developed,* and the period of that development is an extended one. In developing a normal brain we must follow the developmental plan of Nature or we shall encourage disaster. The supernormal brain, the brain that has received a too early development, easily is thrown out of balance, and is less apt to endure. The force that directs the upbuilding of a human brain, though slow moving, is a tremendous force. If we attempt to crowd it, to increase its progress, we have to increase its rate: we have to increase the pressure upon the immature brain cells. These cells are the highest form of living tissue; they are the most highly specialized of all the cells of the human body. They possess, then, in the highest degree, that quality peculiar to all living cells known as irritability. If, then, these cells are pushed in their development, if they are urged beyond the normal rate, it is natural to suppose that this irritability is increased. That being so, the cell itself must suffer some injury. And that seems to be the fact in the supernormal, for the supernormal individual, while he may give splendid service for the time, gives out early, and, moreover, his service is apt to be irregular. His cells, having come into full maturity prematurely, have shortened their existence that much; and, having to carry on their further existence under pressure, are shortening it still more, as well as manifesting irritation symptoms that are the direct outcome of the over-pressure. In the supernormal the Present, not content with its own progress, projects itself into the Future: *the Present devours the Future.*

The behavior of a supernormal individual is in accord with the over-development of his brain. His bodily activities keep pace with his mental; his muscle responses are quick, spontaneous and over-abundant. All the cells of his body are participating in the over-activity, all are rushing, with headlong speed, to their fate.

In conclusion:

In approaching the human mind we must remember its phylogenesis; we must remember that the human mind comes through the human brain, the man brain, and that the man brain is the immediate descendant of the brute brain. If we wish to develop mind in a modern individual we must remember that mind has developed through the motor functions of the animal brain, through a process ages long. Our first concern is the brain; and, whether an individual *be born* subnormal, normal

or supernormal, we must have a knowledge of brain development before we can hope to understand his mind.

In the subnormal, in the feebleminded, (feeblebrained might be a better term) it is doubtful if we have to do with mind at all, for, here, the manifestations are almost entirely motor. Being motor, the results will be motor; that is, the results will follow through reflex action, not through thought action. In the endeavor to help the feebleminded the aim is to accelerate brain action; but we can hope for no great result in a brain whose development has been arrested. *The Past is inflexible and may not be advanced beyond its own limits.*

In the normal human brain much the same condition confronts us, but there is a difference. The motor function still dominates but it is not the only influence present. The man influence, the thought function, shows itself early. We have here an actively functionating brain following the normal course of human brain development. In this brain it is possible to appeal to reason, to bring the motor function and the thought function into close and intelligent cooperation. *The Present is flexible and may be moulded.*

In the supernormal individual, function is too rapid, and must be slowed down; the appeal to reason is just as necessary here as it is in the normal. *The Projection-Future, being over-flexibility, must be restrained within sound limits.*

AESTHETIC UNITY

An Investigation into the Conditions that Favor the Apperception of a Manifold as a Unit[1]

By Margaret Otis

The principle of unity is fundamental for any theory of aesthetics, for the harmonious union of the many in the one is necessarily involved in all aesthetic experience. The treatment of the aesthetic experience as an independent and fundamental life value is found presented by Münsterberg,[2] who places the inner agreement of meaning in the manifold as essential for the beautiful object. Aesthetic unity as thus understood is the subject of the present investigation, for it is a study of the inner agreement and disagreement of the various factors that go to make a work of art.

As a problem in experimental psychology the perceptive process is the one immediately concerned. In all our conscious experience we are constantly unifying various elements into wholes. Given a mass of lines, dots, or material of any kind, a selective process occurs and out of the mass groups are formed, the "higher units"[3] of perception. The dot figure of McDougall[4] well illustrates this process, also the lines and squares used by F. Schumann[5] in his investigation of the process of visual perception. The problem of the attention is involved as in the interpretation of equivocal figures and puzzle pictures, for example, the six-pointed star of James[6] that may be perceived as two superposed triangles, or as a hexagon with six small triangles, one attached to each side. Titchener[7] refers to cases of puzzle pictures in discussing his theory of the two levels of attention.

[1] The problem was suggested by the late Professor Münsterberg and was conducted in the Harvard Psychological Laboratory during the academic year 1909-1910. There were 7 subjects all of whom were either instructors or graduate students of psychology.

[2] H. Münsterberg: *Eternal Values*, 1909, chs. 9, 10.

[3] *Cf.* Ladd and Woodworth: *Physiological Psychology*, 1911, p. 597.

[4] McDougall: Mind, 1902, N. S. XI, 316.

[5] Schumann: Beiträge zur Analyse der Gesichtswahrnehmungen, *Zeitschrift für Psych.*, XXIII, p. 1.

[6] James: *Principles of Psychology*, I, 1890, p. 443.

[7] Titchener: *Psychology of Feeling and Attention*, 1908, p. 228.

Material of like character has been collected by various workers,

The method used in the present experiment depends largely for its effectiveness on just such possibility of a double interpretation of the figures concerned. A manifold is given from which the mind may select and interpret just as in the case of the equivocal figures. The manifold in this case consists of a number, usually six, small objects cut from cardboard. (Plate I, figs. 1-13.) These are arranged in various positions and combinations, and various possibilities of interpretation occur.

In regard to the relative merit of various figures such as the circle, the square, triangle, etc., some information has already been obtained. Fechner[8] finds that the degree of unit that joins the parts of a circle is higher than that which joins the parts of a straight line and that unity between the parts of an ellipse is higher than that of the circle. Puffer[9] discusses the forms found in use in the composition of pictures; pyramidal, diamond shape, diagonal, V shaped landscapes and square. She finds that the pyramidal is the commonest and the square less frequent. Gordon[10] speaks of the triangle as the simplest of enclosed forms, the square as less concentrated, and the circle as the symbol of completeness. Some of the results of the present investigation have a distinct bearing on this question, the triangle and circle proving to be the best forms to be felt as units, in tests of varying character.

Such results are important for Aesthetics, yet our main problem has to do with the question of unity alone. The question of the pleasure derived from unity does not enter in. The subjects in the experiment were instructed to give a judgment merely as to whether a unit was apperceived or not, and the feeling, pleasurable or otherwise, though noted at times, was in no way the object of study.

Thus the purpose at hand is to study the process involved in the act of the mind by which a number of elements are unified into a whole, to ascertain what conditions favor and what hinder the formation of units, to investigate the power of various factors involved and to test their relative importance. This brings us to a description of the experiment itself.

The material used consisted of small objects cut out of cardboard in various shapes (Plate I, fig. 1-13). These are reproduced slightly reduced (one sixth) from actual size used.

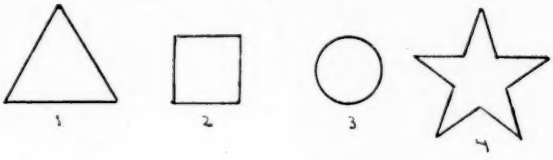
notably: Von Bezolt, The Theory of Color, p. 253, Wallace Wallin, Optical Illusions of Reversible Perspective, Mach. Analyse der Empfindungen, p. 164, Witmer, Analytical Psychology, p. 12 sq.

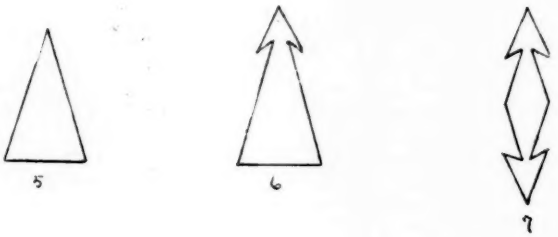
[8] G. T. Fechner: *Vorschule der Aesthetik*, 1876, p. 53.

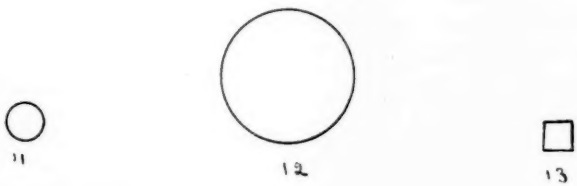
[9] E. Puffer: *Psychology of Beauty*, 1905, p. 138 sq.

[10] K. Gordon: *Aesthetics*, 1909, p. 166 sq.

PLATE I.







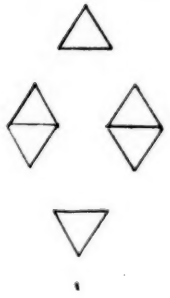
These objects, usually six in number, in some cases nine, were arranged on a black background in various figures within an area about 20 cm. square. (Cf. Plate II.) These figures were exposed by means of a tachistoscopic apparatus arranged as follows: The subject was seated before a black cardboard screen into which was fitted a diaphragm shutter with opening 3 cm. in diameter. On the other side of the screen was a cardboard surface also black, slightly inclined to the horizontal, and arranged to be in the field of view as seen by the subject, who had his eye at the opening of the shutter. The small pieces of cardboard were arranged on this surface. The figures were given an exposure of one-fifth to one-half second and the subject was asked to report in what way he apperceived the objects; whether they were united into a whole, or into subordinate groups, or whether they remained a manifold. The answer was recorded and the objects were rearranged. About thirty such exposures were given at one sitting, the arrangements of the objects being such as to throw light on some especial part of the problem. The objects used at first were white; later color was added, and in some of the final tests grey was used. The colors used were kept the same throughout, being red, green, blue, yellow, violet, orange, of the standard colors as given in the catalogue of Bradley. In one case only, two different shades of green, red, and violet were used. The time used was kept constant as far as possible. The shortest exposure was used at first for white objects on a black background. When objects of different shapes and colors were used, it was found necessary to give a longer exposure, and for the case where nine objects were used in relatively complicated figures a long exposure was needed. The influence of the time element, however, was considered only incidentally. In one case, only, the same figures were repeated using a longer time exposure. The object was to give sufficient time for the subject to be able to perceive the figure clearly, but not enough to allow him to study it, for it was desired to have merely the first impression recorded.

A unit as here used means not merely that the objects are felt as a whole simply because in the same field (the subjects were cautioned especially in this regard), but the individual parts must be felt as bound together, as belonging together in some way.

The factors investigated that have influence in the unit-making process are the following:

1. *Position.* The position or arrangement of the elements

PLATE II.



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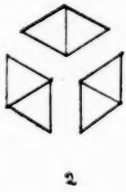

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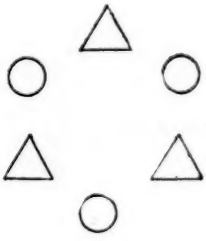

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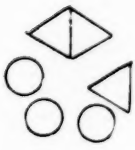

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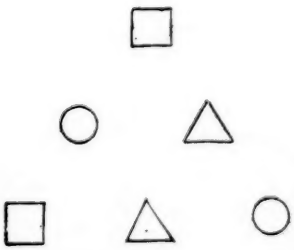

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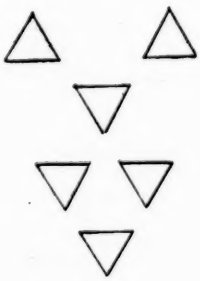


6

may give the character of unity to the group, such as a symmetrical arrangement, arrangement in a geometrical form as a circle or a triangle, arrangement in lines, or it may be that mere contiguity may give unity.

2. *Form.* Like forms such as triangles or circles may be grouped together.

3. *Color.* Like colors may be grouped together to form a unit.

4. *Direction.* Like direction has the power to make a unit, and certainly the direction in which the parts point has at all times a powerful influence, even if it is not the predominant one.

5. *Size.* The size of the elements is found to be important in its influence on the grouping.

6. *Association.* The binding principle may be association with some idea already in the mind.

Some of the terms used in the course of the experiment need to be defined as to their exact application, and are as follows:

The term *unit* is used when reference is made to a whole formed of all the elements present in the field. The term *figure* is used when reference is made to the arrangement of the elements used. The term *group* is used when some of the elements form the whole, the others being neglected or going to form another group. Thus six objects might form three groups composed of two each. The term *manifold* is used when the objects in the field are seen as individuals and are not grouped.

Groups may be formed determined by various factors mentioned above. Thus *color group* refers to a group determined by color. *Form group* refers to a group determined by the form of the component parts. A *position group* is determined by the arrangement of its elements. Similarly the terms *direction group* and *size group* are used when direction and size respectively are the predominant factors that determine the group.

It often occurs that the subject can report more than one experience upon looking at the figure exposed, that is, he may see it in one way first, and then another interpretation will flash upon his consciousness. A unit may be his first experience, and then the figure will appear to be split into groups. All such experiences have been recorded. In calculating the results and making up the tables the numbers refer to the first experiences, yet it often happens that a consideration of the

second experience is helpful. In some cases certain ways of interpreting the figures will occur only as second experiences. If a unit is reported as first experience by four subjects and as second by three, it would show that the unity of the figure was felt by all, though in a less degree by some.

Form. The first experiment consisted in using six equilateral triangles, white on a black background, arranged in various figures. The objects at first were all the same shape. The next step was to study the effect of using objects of two different shapes, three triangles and three circles; and later a greater diversity of parts was used, two triangles, two circles and two squares. See Plates I and II. The figures in which the objects were arranged were, first, a circle, then a triangle, a diamond, a rectangle, a figure called for convenience a divided hexagon, and a figure something like an arrowhead. Each figure was repeated five times, each time with a different combination of its elements, the first exposure showing all like parts, the second two different shapes, the third greater diversity in the elements and so on to the fifth exposure. The results are tabulated in Table I. The exposures are numbered one to five. The numbers under the words *unit, group,* and *manifold* show the number of times the figure was judged to be the unit, group or manifold respectively. The answers as tabulated show a decrease in unity when unlike forms are used as elements of the figure. The judgment would often be that the figure was a poor unit, so the distinction is made in the table between a good and a poor unit.

From these results it appears clearly that the effect of introducing different shapes as elements in the figures is to lessen the unity and at times to break it completely. The total number of cases of a good unity for all the figures when like forms are used is 28 out of a possible 42; that is, 66%, while in case of the same figure under like conditions except that unlike forms are used, the number of cases of good unity is only 18 out of a possible 168, or 10%.

We can also study in this series the comparative excellence as units of the figures used. Referring again to the table, we see that the triangle is a unit 32 times out of a possible 35, the circle 30 times, the diamond 21 times, the divided hexagon 16, while the arrowhead is a unit only 14 times, and the rectangle only 9 times. Of these figures with this time of exposure we can say that the triangle is the best unit, the circle next, both possessing a high degree of unity, the diamond comes not far behind, while the divided hexagon proves to be not so

good a unit because of the tendency to apperceive it as three groups. The arrowhead figure proves a poor unit, and the poorest unit is the rectangle.

TABLE I

Exposure	*Circle*				Exposure	*Triangle*			
	Unit Good	Unit Poor	Groups	Manifold		Unit Good	Unit Poor	Groups	Manifold
1	7				1	6	1		
2	2	5			2		7		
3	2	3		2	3		5	2	
4	1	5		1	4		7		
5	1	4		2	5		6		1
	30			5		32		3	
	Diamond					*Rectangle*			
1	6	1			1	2		2	3
2		3	4		2	1	1		5
3	1	2	4		3	1	1	5	
4		4	3		4	2		1	4
5		4	3		5	1		1	5
	21		14			9		26	
	Divided Hexagon					*Arrowhead*			
1	6		1		1	1	3		3
2	3	3	1		2	1	3	1	2
3	1	1	1	4	3		2		5
4		2	5		4	1	2		4
5			6	1	5		1		6
	16		19			14		21	

Color. For the purpose of studying the effect of color six square objects were used of three different colors, two of each, in various combinations. These squares were arranged

to form the following figures: circle, cross, rectangle, a pyramid-shaped figure, triangle with apex below, and a monument-like shape with the parts contiguous. All possible combinations of the three colors were used. In general, color is found to have a decided influence on unity, but some figures keep their unity better than others. The comparative excellence of the above figures was found to be as follows, as is seen from Table II. The circle and cross are the best units, the monument next, the rectangle next, then the inverted triangle, and the pyramid-shaped figure the least unified.

TABLE II

	Unit	Manifold
Circle	27	6
Cross	27	6
Rectangle	17	15
Pyramid	8	24
Inverted triangle	15	16
Monument	24	7

Combinations of two colors were next tried. The same figures were used, formed of six squares as in the preceding experiment. The general result was that where colors were widely contrasting the figure would break up into two color groups. The subjects vary very much individually as to the influence of color upon their appreciation of form. The same general result as in the preceding experiment in regard to the unity of the different figures was found to hold. Only three cases of manifold were reported. The choice was usually be-

TABLE III

	Unit	Group	Manifold
Circle	16	18	1
Cross	21	14	
Rectangle	15	18	2
Pyramid	9	26	
Inverted triangle	18	17	
Monument	24	11	

tween a unit and two color groups. That there should be eleven cases of color grouping in the case of the monument where the parts were contiguous is significant for the effect of color. See Table III.

Color Opposed to Form. In the next experiment three squares and three triangles were used and combinations of two colors, the division according to color and according to form not coinciding. The object was to see whether color or form was the stronger factor in determining a group. With the time used, one-fifth second, the result proved to be that color without question attracted the attention first, and judgments were uniformly given in favor of color groups. A longer time, one-half second, was given, and the same series of figures was used again without difference in the results as to appreciation of distinction in form. Some subjects reported that they did not notice that there were different shapes used, the impression being merely spots of color.

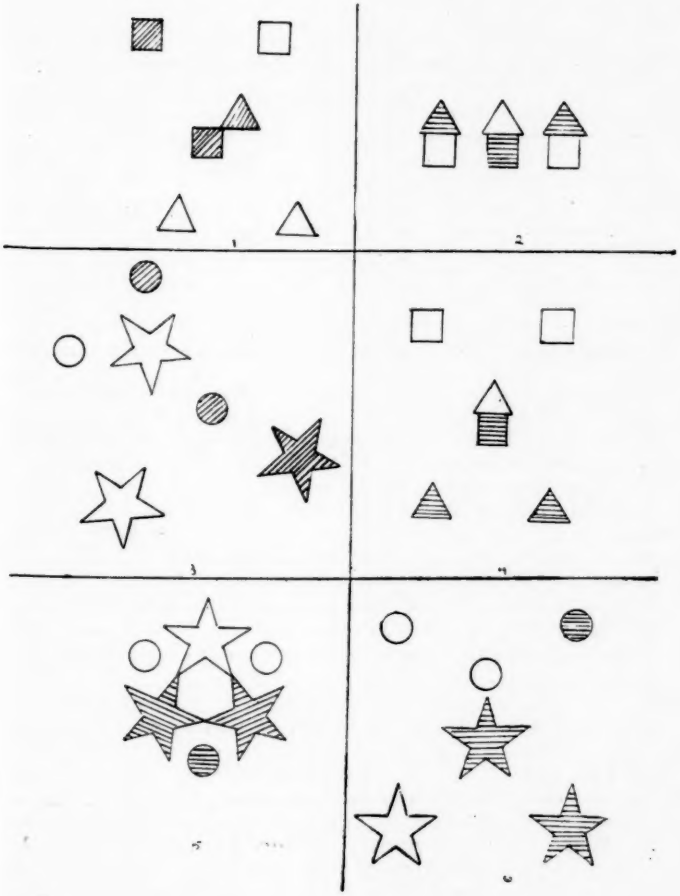
The effect of the longer time was to increase the number of units and color groups, and to decrease the number of cases of a manifold. In the first series, time one-fifth second, there were reported 51 units, 70 color groups, 16 manifold; with longer time, one-half second, there were reported 60 units, 85 color groups, 9 manifold.

As to the relative merit of the triangle and the circle the triangle was judged a unit slightly more often than the circle. In the first series the circle was reported a unit 24 times and the triangle 27 times; with the longer exposure the circle was a unit 29 times and the triangle 31 times. Contiguity proved a stronger factor than color when the arrangement was in three groups of two each. In the first series contiguity formed the group 28 times, color 10 times; with longer time, contiguity formed the group 25 times, color 13 times.

With the forms used in the preceding experiment it was found that even with long exposure the influence of color was stronger than the influence of similarity of shape. The difference between square and triangle was evidently not sufficiently great to have much effect in forming groups. In order to test the matter further a greater difference in form was sought and large stars were now combined with circles of smaller size. See Plate III.

Five figures were used: an irregular figure, called a butterfly by some of the subjects (Plate III, fig. 3), the circle, the cross, an hour-glass shape, and another irregular arrangement. Six different combinations of colors were used of varying contrast-

PLATE III.



ing power, and the arrangement of colors within the figures were varied. The combinations used were blue-yellow, violet-green, orange-red, green-yellow, red-yellow, and red-green. Time used was one-half second. For the result see Table IV.

TABLE IV.

	Unit	Form-group	Color-group	Manifold
Butterfly	3	10	27	2
Cross	22	3	17	
Circle	25	3	14	
Hourglass	14	3	22	3
Irregular		9	28	5
Total	64	28	108	10

The total number of form groups to the total of color groups is 28 to 108, which amounts to 80% of the judgments in favor of color. A decided preference thus is shown for grouping by color, notwithstanding the fact that the difference in form was made very marked.

By referring to Table IV we see that the circle is the best unit of the figures chosen, it being a unit 25 times out of a possible 42, the cross very nearly as good, a unit 22 times, the hour glass 14 times, while the irregular arrangements show no unity except that the first figure is a unit three times through association with a butterfly.

The Effect of Suggestion. A test of the relative strength of the influence of color and form of a different nature from the preceding is now introduced. Hitherto the subjects have been requested to keep their minds as free as possible from any preconceived ideas, and to maintain the attitude of passive attention throughout. At this point the influence of suggestion was made a feature of the experiment. The same material was used as heretofore; squares and triangles being combined, and stars and circles. (Plate III, figs. 3, 4, 5, 6.) Fifteen figures were arranged in which form groups and color groups were opposed. Color combinations used were the same, red-green, red-orange, red-yellow, green-violet, green-yellow, blue-yellow. The time used was one-half second. Before each exposure the subject was instructed that he would see

the figure in a particular way. At one time a form group was suggested and at another a color group, the whole number of each being the same. The form of the instruction was as follows: "You will now see two color groups, one red and one green," or "You will now see two form groups, a group of stars and a group of circles," and so on. The result of this experiment is given in Table V.

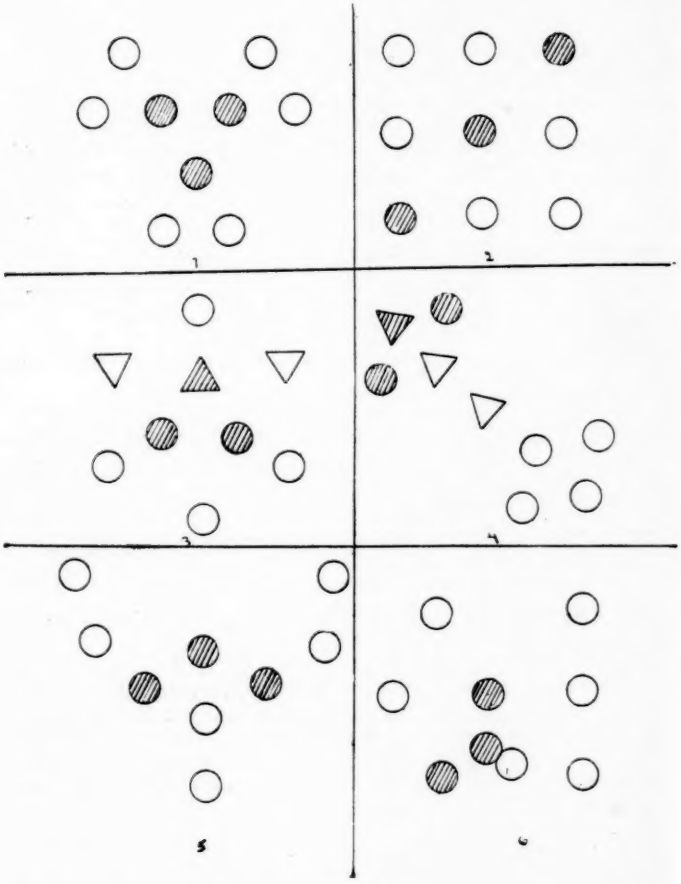
TABLE V.

	Unit	Form-group	Color-group	Manifold
Color-groups suggested. . .	6	10	89	
Form-groups suggested. . .	8	40	56	1

By studying the above table we find that when color is suggested there occur 85% of color-groups; when form is suggested the color-groups are still in the predominance, being 52% of the whole number of exposures; while when color is suggested, only 10% of the figures are seen as form-groups, and when form is suggested the number is increased only to 38%. This evidence seems quite conclusive in proving that color is a stronger unifying factor than similarity of form. A study of special figures (Plate III, figs. 4, 5) shows that some give color-groups preferably even when form-groups are suggested, while there are none to which a preference for form-groups is shown when color is suggested.

Form Opposed to Color with Increased Complexity of Material Used. A complication of the experiment was introduced by taking nine objects, variously combined into six different figures. See Plate IV. These figures were repeated on three different occasions. When presented the first time the objects were all of the same shape, circles. The next time two different forms were used, six circles and three triangles. The third time the objects used were four stars, three triangles, and two circles. On each occasion two colors were used, the division by color and the division by form not coinciding. The first figure (Plate IV, fig. 1) easily falls into three triangles, and for that reason is not so good a unit. The arrangement in a square, figure 2, proves to be the best for

PLATE IV.



holding so many parts together. The circle with inner filling, figure 3, proves to be not so good a unit as the circle unfilled, the increased complexity of the figure decreases its unified character, showing that simplicity is an essential for a good unit. In case of figure 4, though the axis of the balance is diagonal, yet it is one of the best units of the series. The holding power of the diagonal line is strong. Figure 6 is a combination of three distinct position groups. These have no connection with each other and thus the figure does not make a good unit. In the short exposure the arrangement of the three groups is hardly detected, and the judgment of a unit is given only where there is some association, as of a letter or sign. Figure 5 is one of the best units of the series, second only to the square, association with a Y helping the unity, the symmetrical arrangement also assisting. The number of judgments in favor of unity for the six figures respectively, throughout the three series of exposures, was: figure 1, 21; figure 2, 60; figure 3, 43; figure 4, 48; figure 5, 53; figure 6, 10. Therefore, arranged in order of excellence as units, we have figures 2, 5, 4, 3, 1, 6.

The effect of introducing different forms into the figures in the second and third series of exposures was to decrease the number of color groups, and to increase the number of cases of manifold. Units remain about the same notwithstanding the fact that the repetition of the figures in this way increases the chance of their being seen as a unit on account of their familiarity. The number of color groups in Series I, where circles alone were used, was 131; in Series II, where circles and triangles were used, it was 87; in Series III, where stars, circles, and triangles were used, it was 36. The number of form groups, with circles and triangles used, was 10; the number of form groups, with stars, circles, and triangles used, was 12. Thus, though the effect of introducing different forms into the figures is to decrease the number of color groups, still the total number of color groups exceeds the number of form groups. This is a confirmation of the fact already established that color is a more important factor than form in determining groups.

Direction. The next factor that makes for unity to be studied is the influence of the direction in which the component parts point. For this purpose six isosceles triangles were chosen with acute angle at apex (Plate I, fig. 5), all of the same color, gray. These were arranged in various figures, a triangle, rectangle, a V and V inverted, triangle inverted and

diamond. (Plate V.) At first, these triangles are made all to point upward, then downward, then to the right, then part up and part to the right, and finally part to the right and part to the left. This change of direction proves to have a very noticeable effect on the unity of the figure. The subjects were asked to discriminate between three degrees of unity; excellent, good and poor. The figures suffer a marked decrease in unity, according as the direction of the parts is changed. The results obtained by judgments on figure 1, Plate V, are given in Table VI. The other figures suffer a decrease in unity in like manner. The triangle with parts all pointing up (Plate V, fig. 1) is the best unit of all, all the subjects judging it an excellent unit.

TABLE VI.

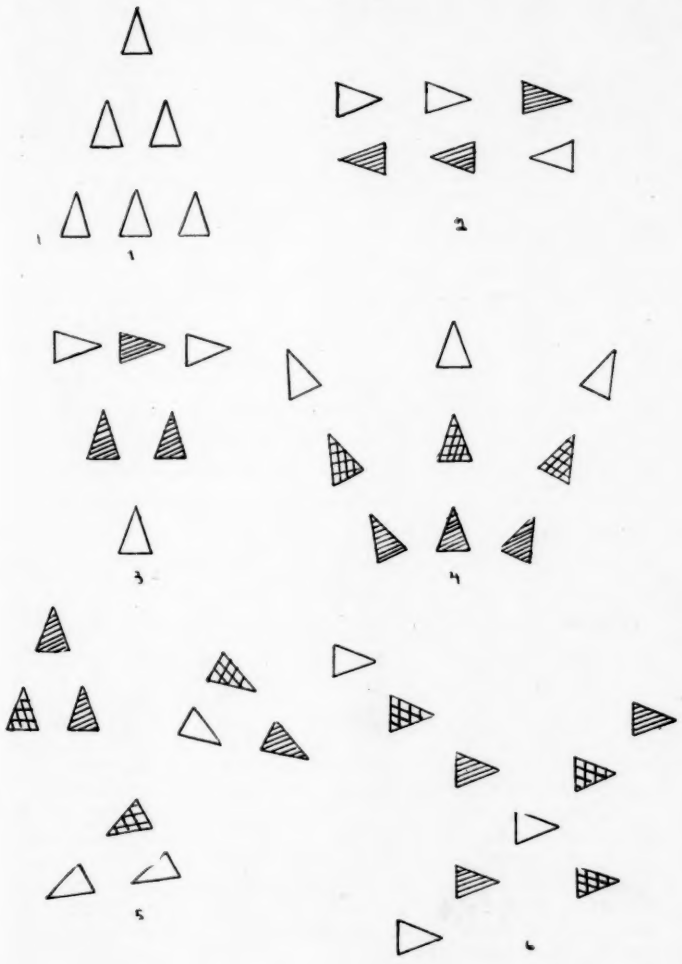
Direction of parts	Unit			Groups	Manifold
	Excellent	Good	Poor		
Up	7				
Down	3	1	2	1	
To right	1	2	2	2	
3 up and 3 to right		2	2	3	
3 to right 3 to left		2	3	1	1

Color Opposed to Direction. The preceding experiment was repeated with the addition of color. The combinations of colors used were red-green, orange-violet, blue-yellow, and red-yellow, the color being evenly divided among the objects. Color in this case is the more potent influence in determining groups, the number of color groups to the number of direction groups being 57 to 13. See Table VII.

Another experiment opposing color to direction was made, using more complicated figures, nine objects and three colors. (Plate V, figs. 4, 5, 6.) The color combinations were violet-red-green, blue-yellow-red, orange-green-blue, red-yellow-violet. The number of cases of manifold were noticeably increased, confusion being caused by the change in direction of parts and the number of the colors used. The number of color groups slightly exceeded the number of direction groups, 39 to 23.

To emphasize direction another experiment was made using as material triangles tipped with an arrowhead, and diamond-

PLATE V.



shaped objects tipped with arrowheads at both ends. (Plate I, figs. 6 and 7.) Six of these objects were used, three single and three double-direction, and two colors. The color combinations were red-green, orange-violet, blue-yellow, and red-yellow. Fifteen figures were used, and were then repeated with a different arrangement of the colors. Direction thus emphasized produced more groups than color, direction groups to color groups being 100 to 68. Fewer cases of unity and more cases of a manifold occur, inasmuch as both the distraction of color and of diversity of direction were present.

In general, color and direction were found to be fairly evenly balanced factors. Groups could be arranged to favor one or the other. Much depends on position and the arrangement of the colors. Color favored by position will prevail. Likewise when direction is assisted by position, direction prevails over color, as in the case of the arrangement in lines (Plate V, fig. 4), direction groups to color groups being four to two.

TABLE VII.

	Unit			Groups		
	Good	Medium	Poor	Direction	Color	Manifold
Six triangles, two colors...	28	45	44	13	57	22
Nine triangles, three colors..	15	42	33	23	39	59
Six arrowheads two colors...		2	8	100	68	22

Size. The relative size of the objects forming a group has heretofore not been regarded, all the objects in the field of vision being the same size or nearly so. The effect of size was now made a subject for investigation in itself. For this purpose circles were chosen to prevent any influence of direction inasmuch as the circle does not guide the eye beyond itself. Three large circles and three small ones were taken, all of uniform color, gray; this being to avoid the distraction of color. The size of the circles was 17 mm. and 6 mm. in diameter, respectively. (Plate I, figs. 8 and 11.) Time used was one-fifth second. Thirty different figures were presented, some symmetrical, some lines, some triangles, and some irregular. The result was more uniform than was the case with any other factor. The subjects seemed to be affected by size

in the same way and to the same extent. The three large circles were grouped together quite regularly and the three small circles also, even in cases where position would favor another grouping. Moreover, the group of large objects usually appeared first in order of time. The total of size groups perceived out of 210 exposures was 183, units 15, position groups 6, and manifold 6; that is, 87% of all ways of apperceiving the figures exposed consisted of groups according to size. Of these there were 49 cases of perceiving one group only, in which case the group was the one composed of the large circles. In 41 cases the large group was reported as being seen first and in 15 cases it was pronounced a better group or more prominent. Only in two cases was the group of small circles pronounced better, and in each of these the central position favored it.

A second experiment with size was tried in which nine circles were used, three sizes, 25 mm., 12 mm. and 6 mm. in diameter respectively. (Plate I, figs. 12, 3, 11.) The time used was longer, one-half second. The result corroborated the result of the preceding experiment. Groups were formed according to the size of the objects, 201 cases out of a possible 210, or 90%; only 5 cases of unity were reported, 3 position groups and one manifold. There were reported 87 cases of one group only, this being the group of the largest circles; 55 cases of two groups, consisting of the large and medium sized. Quite regularly there was a difference in time of apperception of the groups, the group of large circles being seen first, medium sized next, and smallest last. When two groups were apperceived, the large ones appeared first 44 times. The order of large, medium and small was reported 60 times, and the order of large, small, medium 8 times. In the latter case the group of small circles was usually in the center or some prominent position. The order medium, large, small was recorded once.

Color Opposed to Size. The material, figures and time were the same as for the first experiment with size, with the addition of color. The combinations of color were: red-green, blue-yellow, orange-violet, red-yellow, orange-green. There was a decided tendency for the formation of size groups rather than color groups. Of 190 exposures there were 147 cases of size groups or 81%, 9 cases of unity, 3 of position groups and 21 color groups. One group only, a group of large circles, was seen 46 times; and again, when both groups were seen, the group of large circles entered consciousness first. This

was reported 56 times, while the opposite order, small first and large next, was reported once in the case where the small circles outlined an outer triangle. It might be suggested that, inasmuch as size was the new feature introduced into the experiment, that might be the reason for its proving so powerful a factor. This consideration was outweighed by the fact that the series where size was opposed to color followed upon two preceding series where color had not been used, thus making color the additional feature of the experiment; so that novelty in itself can hardly account for the preponderating influence of size. Also, inasmuch as the subjects had been giving judgments of color groups for some time, it might be argued that this, if established as a habit, would influence their judgments in this case. Whether a new feature introduced or an habitual manner of apperceiving would be the stronger influence can hardly be decided, but the results would hardly be so uniform for all the subjects in case any uncontrolled influence were at work. The subjects were more unanimous in their response to the size factor than to any other in the whole series of experiments. Their susceptibility to color influence was markedly not uniform, and seemed to be quite an individual matter.

Form Opposed to Size. The material consisted of the large and small circles 17 mm. and 6 mm. in diameter, respectively; large and small squares, sides 15 mm. and 5 mm. respectively. The color used was gray. (Plate I, figs. 8, 11, 10, 13.) These were arranged in various figures. Size groups still predominated, though the percentage, 75%, was not so large as in the previous experiments. The number of position groups was slightly increased, being 19 out of 180 exposures. Units seen numbered 15, there were two cases of manifold, while only nine cases of form groups were reported. Again we find cases of the group of large objects seen first 13 times; and when both a group of large and a group of small were seen, the order in time of large, then small, occurred 78 times; the opposite order, small first, was reported once. For the most part the subjects reported that the difference in form did not particularly attract their attention, although at times it acted as a disturbing factor. Yet in the case of two subjects the squares stood out prominently contrasted with the circles. And of the 37 cases of form groups reported (and of these only nine were first experiences), there were 22 cases of one group only seen, and that the group of squares. One case of circles only occurred. Twice the order occurred of squares first, and then circles, when both were perceived.

Combinations of Different Sizes. The question arises as to just how much of a difference in size there must be in order to produce a marked effect in forming units. The combination of circles 17 mm. and 6 mm. in diameter, respectively, was effective, the difference in diameter being 11 mm.; also that of circles 25 mm., 12 mm., and 6 mm. in diameter, respectively, with difference of 13 mm. and 6 mm. The step was next taken to make the difference in size less in order to test the extent of its importance. Circles 17 mm., 12 mm. and 9 mm. in diameter respectively were used in three combinations: circles 12 mm. and 9 mm. in diameter, with the difference of 3 mm.; circles 17 mm. and 12 mm. in diameter, with the difference of 5 mm., and circles 17 mm. and 9 mm. in diameter, with difference 8 mm. Six objects, the same time, the same figures and the same combinations of colors were used as in the case of the preceding experiment where color was opposed to size. Only four subjects were available for this experiment, but the result was the same for all of them. The first combination of circles 12 mm. and 9 mm. in diameter, with difference 3 mm., produced no size groups, the subjects reporting that the difference in size was not noticeable, and accordingly color groups predominated. When the combination of circles 17 mm. and 12 mm. in diameter was used, the subjects reported that they noticed the difference in size, but it was not great enough, evidently, to act as a unifying factor, for here again no size groups occurred, and color groups predominated. But when the combination of circles 17 mm. and 9 mm. in diameter was used, with difference of 8 mm., size groups again appeared. The smallest difference in size, when size was effective, three sizes being used, was 6 mm. A difference of 5 mm. in diameter was ineffective, while a difference of 8 mm. produced size groups. The conclusion reached is that the difference in size, under the conditions of this test, must be at least 6 mm., and preferably 8 mm. in order that size might be effective as a unifying factor. Where the difference in diameter was 11 mm. there was no question of the effect of the element of size.

Summary. I. Position:[11] Contiguity makes for unity.

[11] Stratton considers that the interest in space form is more primitive than the sense of color. By form he means what we have here called position. He speaks of the "rivalry between the sensuous and the interconnective element," and shows that one or the other is subordinated. "If the attention is occupied with the color, the form and significance are in the background."
Stratton: Experimental Psychology and Culture, pp. 250 and 254.

Position assists form to overcome color. Position in a line has great power. Position throws the balance in favor of color or direction. Position as an opposing factor to size forms a group. Of the geometrical figures used the triangle and circle are the best units, the diamond and square next, lines are effective, the rectangle is good and other figures in varying degrees. This estimation is merely tentative. It seems to be justified by the tests that have so far been made. It might be that other conditions would bring out different results.

II. Form: Differing forms used within the figure disturb the unity. The effect also is to interfere with color grouping, and to produce a manifold. Similarity of form may determine a group, but this is, perhaps, the weakest of the factors studied, and it proves to be weaker than color. The influence of form was found to be also weaker than size.

III. Color: Color proves to be a strong distracting influence. Color is a stronger influence than form in determining groups. It is stronger than form even when suggestion is used to assist. Color and direction are nearly equal factors. Color is weaker than size as a unit making factor.

IV. Direction: Direction is a distracting influence and is able to break a unit. The power of direction is nearly equal to that of color, and when assisted by position may be stronger than color.

V. Size: Size is the strongest factor studied, when the difference in the size of the objects is made sufficiently great. Size is stronger than position, color, and form.

Analysis of the Process of Unification. In studying the influence of these various factors in the course of the experiment, it has been possible to observe the process of unifying. This process is not the same for all. Some minds are analytic while others may be called synthetic. The subjects have shown marked individual characteristics in their method of apperceiving. For instance, one subject will serve as an example of a pronounced synthetic type of mind. He shows the tendency to see the objects as individuals at first and to report a unit as a second experience. When questioned as to this habit, he said that the parts would persist in coming first, and the unit developed later. On the other hand, another subject illustrates the opposite tendency. A unit for him was the first experience in the majority of cases. The other subjects, while not as marked in type, exhibited many individual traits. Especially their susceptibility to color varied, three being ex-

tremely sensitive to the color influence, others not so much so, and one noticeably not influenced by it. This bears out the remarks of Stratton[12] in regard to the personal equation in the matter of form and color.

The processes of analysis and synthesis noticeable in the mental operations of the above-mentioned subjects may be found, the one or the other, in almost every judgment given throughout the experiment. It has been interesting to watch the influence of the various factors at work. We might say, in general, that the process in question is either destructive or constructive. A unit is seen and then is torn in pieces, or a manifold is seen and of the elements a unit may be constructed. Often the closing shutter would interrupt the process so that it was caught, as it were, half way, and the subject would report that he saw a unit, but that it was just about to break. A "tendency to break" was a frequent comment made when the force of the factor that was being studied, color, form, as the case might be, was not quite strong enough to prevent the unit and yet its influence was evident in consciousness. It seemed almost possible to measure the destructive tendency.

In studying the influence of the various factors at work, we find the following results: When two unit making factors are opposed to each other, the result varies according to the strength of the opposing elements, and it is possible to distinguish six different degrees of the influence of what may be termed the secondary factor. For one influence is usually the stronger and may be termed the primary or predominant factor, while the other is weaker and secondary.

1. The primary factor determines the group, while the secondary, though objectively present, does not enter the threshold of consciousness. This case occurs repeatedly. Many times when color and form were opposed, the subject would not be conscious at all that different shapes were used. Also when color and size were opposed, the difference in size being purposely made very slight, the difference of 3 mm. in the diameter of the circles was not noticed, and the subjects reported that the circles seemed about the same size.

2. The primary factor determines the group, while the secondary is just noticeable but is ineffective. In cases of unity determined by arrangement of the parts in a circle, colors used were apparent to the subject, but had no effect in disturbing the unity. Also where color was opposed to size, a difference in size of 5 mm. in the diameters of the circles was

[12] Stratton: l. c., p. 251.

noticed, but did not have power enough to influence the grouping.

3. The primary factor determines the group while the secondary is not only noticeable but has a decided effect. It may have a destructive tendency. Its effect is to act as a disturbing element, though it has not power enough to break the unit. Many cases occur where color is reported as a disturbing element. Direction was felt to be disturbing many times, for instance, in the case of Plate V, figure 3, a medium unit was reported, but the effect of motion due to the direction was felt.

4. The effect of the secondary factor is constructive. The primary factor determines the group while the secondary draws into it an additional element. There are many cases of this constructive influence, for example, the case where large circles form the group while a small red circle was drawn in through the influence of color. The very act of including the additional element was seen in process in one case. The large circles made the group while a tendency to include a small orange circle was felt, but the process was not completed. Three circles made a group determined by form, while a large square was added because of its size.

5. The factors may be evenly balanced in power and as a result cases of fluctuations or rivalry occur. In these cases of rivalry one or the other of the forces may win out and determine which group is to be apperceived; or a confusion arises, neither winning, and a manifold is then reported. Cases of rivalry between form and color occur, as in the case of Plate III, figure 3, and many others. Sometimes color wins out, sometimes the fluctuation persists and sometimes confusion results. There are cases of rivalry between direction and color, as Plate V, figs. 4, 6. In the case of Plate V, fig. 6, the conflict results in a manifold. In one case the process of grouping by color was actually interrupted by a sudden perception of direction groups. A size group and a position group were seen, while the rival tendencies of size and color produced a disagreeable feeling tone.

6. The primary factor determines the group when the power of the secondary factor suddenly increases, acts destructively, and causes confusion and a manifold results. A number of cases occurred where a unit was reported as a first experience and a manifold as a second. This shows just such an operation as described. The influence of color is often found to act in this way. A poor unit was reported as a first experience, then two groups as a second, and finally the disintegra-

tion was completed and a manifold was the result. The feeling of confusion often accompanied such an experience.

The data upon which these results have been based are too few to permit final conclusions upon all the points involved, but they have been presented for the suggestions they offer and should prove of value not only for theoretical aesthetics, but also for practical purposes especially in the fine arts, decorative art, and advertising.

SOME VARIABILITIES AND CORRELATIONS IN LEARNING

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This paper reports an investigation of the following problems: To what extent are the first performance and other early performances measures of succeeding performances? Does practice make an individual's performance more consistent? Does practice make individuals of a group more like one another in their performance? What is the relation of card-sorting to intelligence? What is the relation of gain in card-sorting to intelligence?

Twenty-seven normal school students sorted cards for 25 seconds, 20 successive times during a period of 50 minutes. This was repeated by the same subjects after ten days, then one day later and finally after an interval of three and a half months. Fourteen other subjects fitted 36 cubes, each of whose faces had a separate color, into a box, for 23 successive school days. Of these 14 subjects, 7 knew the time record after each performance, whereas the other 7 at no time during the experiment knew any of their time records.[1] Sixteen of the card-sorting subjects, who had worked together in the same group in all classes for a term, ranked one another in general intelligence.

To what extent is the early performance the measure of succeeding performances?

On the basis of the median of each successive five performances in card-sorting the one class of 16 subjects, the other of 10, were ranked.[2]

Correlations between the early ranks and the succeeding ranks, and between the final ranks and others, were then determined. Similar data were derived for the colored cube test. Table I gives these correlations. Considering the two groups for card sorting (A) there is practically no difference between those with the first five and those with the last five. For the color-cube test there is no difference worth mentioning

[1] Hazel Coburn, Helen Collins and Garry C. Myers. Some Studies in Learning. To appear shortly in *School and Society*.

[2] To simplify computation only ten (chosen alphabetically) of this class of 11 were considered.

except in the not-knowing group, where the advantage is decidedly in favor of the correlation with the first five, i. e., in this case the ranking for the average of the first five performances are more like all the succeeding rankings than is the ranking for the average of the last three like all the other rankings. The "not-knowing" group toward the end had less incentive to do their best than the "knowing" group.

Similar data are shown below table (C) from 14 girls, who, learning to use the typewriter, practiced on the same sentence for 3 minutes per day for 25 successive school days. Seven of them emphasized accuracy; the other seven speed. Those who emphasized accuracy tended more to keep the same relative rank throughout than those who emphasized speed. Apparently, then, the learner's knowledge of his rate of speed and his aim to be rapid even at the sacrifice of accuracy tend to increase shifting of relative ranking of individuals within a group.

TABLE I.

C. TYPEWRITING

	With First		With First Five		With Last Five	
	Accuracy	Speed	Accuracy	Speed	Accuracy	Speed
First five...	.82	.93	1.00	1.00	.18	—.04
Second five.	.57	.31	.89	.43	.86	.25
Third five..	.29	.13	.68	.30	.93	.43
Fourth five.	.13	—.04	.47	.00	.84	.70
Fifth five...	.18	—.04	.64	—.11	1.00	1.00

In card sorting, the correlations with the second five, however, which is about the same as with the seventh five, gives far better results. The initial single performance does not measure very closely the succeeding ten performances. For example, for the 16-group it correlates with the second single performance .71; 3rd, .55; 5th, .60; 10th, .65; and the fifth with the 10th, .76. The correlation of the initial trial with the median of the first is +.73 and for group 10 it is +.83.

The 10-group have considerably higher correlations, i. e., the relative ranking at any one point on the whole, more closely agrees with all other rankings than for the 16-group. This is significant from the fact that the larger class is a highly selected one, being made up of the best of a class of over 100 whereas the other class is one of the regular sections of the same class.

TABLE I.

CORRELATIONS
BETWEEN DIFFERENT STAGES OF PERFORMANCES

A. Card Sorting (26 subjects)

Successive Five Trials	Class of 16				Class of 10	
	With First Five	With Second Five	With Seventh Five	With Last Five	With First Five	With Last Five
1	1.00	.75	.53	.24	1.00	.53
2	.75	1.00	.72	.49	.94	.80
3	.63	.90	.64	.55	.81	.86
4	.65	.89	.72	.55	.95	.83
5	.31	.65	.84	.67	.94	.80
(10 days interval)						
6	.38	.76	.85	.45	.90	.78
7	.53	.72	1.00	.41	.92	.67
8	.29	.61	.84	.49	.76	.77
9	.35	.60	.70	.28	.75	.80
(1 day interval)						
10	.32	.65	.87	.52	.86	.86
11	.32	.71	.85	.51	.66	.80
12	.51	.71	.82	.49	.67	.83
(3½ months interval						
13	.31	.42	.41	.89	.54	.56
14	.24	.49	.35	1.00	.53	1.00
Average	.47	.70	.72	.54	.79	.78

	Class of 16	Class of 10
4th with 5th trial	.71	.89
8th with 9th trial	.86	.70
12th with 13th trial	.39	.60
1st with 1st five trials	.73	.83

TABLE I.

B. Colored Cubes

	Subjects not knowing rate	Subjects knowing rate	Subjects not knowing rate	Subjects knowing rate
	First five with		Last five with	
Second five	.71	.98	.86	.13
Third five	.79	.37	.86	—.03
Fourth five	.84	.40	.89	.45
Last three	.86	.13	.82	.28

On the other hand the discrepancy seems to be explained largely by the fact that X of group 16, who ranked lowest in her first five, reached the highest maximum record for the class on her 60th trial and fell to the 11th place in her last five trials. Her relative positions by fives throughout are 16, 13, 11, 11, 4, 2.5, 4, 3, 3, 3.5, 2.5, 4, 13, 11.5. No other such record was found in this or the other group.

Apparently, for card-sorting at least, the first five trials are about as representative of all the others as are the last five.

Putting the problem in another way. *To what extent do the performers maintain their relative rankings throughout?*

Table below shows that of class 10 those who were in the lower half of the group at the start remained there as a rule. In only 8 of the 14 series of 5 were there exceptions and there only one case per series. The shiftings were limited to 4 persons. The letters in the second row indicate individuals of the lower half who shifted to the upper half on the respective trials.

Rank (in series of five)...	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Shifts from 2nd to 1st half	–	B	K	–	–	–	C	C	K	–	K	K	O	–

Excepting the one "abnormal" case, of class 16, similar consistency in ranking obtained throughout the periods of performance.

By reference to the table of correlations between the rankings at various points in the curve of practice, one sees there strong evidence that, as a rule, the individuals tended to maintain the same relative position throughout. This is a bit more evidence of original nature.

Thorndike found a Pearson coefficient of .48 between first and last performance in addition. Those who start out best come out best after a moderate amount of practice. His 10 individuals who led at the beginning gave at the close of the hour 23.5 examples per hour; next 10 gave 20.0; remaining 8 (lowest) only 11.1.[3]

In a similar experiment in addition by 4th grade children Thorndike found that those who start out best come out best.

Wells by addition and cancellation tests found on the whole the same relative position before and after practice.[4]

Hollingworth (*Vocational Psychology*, Ch. XI) put each of 13 individuals through 205 repetitions of seven different mental tests, 5 trials, at 2½ hour intervals, made daily. Corre-

[3] Variability between Individuals. *Amer. Jour. Psychol.*, 1908, 19: 374.

[4] *Amer. Jour. Psychol.*, 1912, 23: 75.

lating the ranking of the subjects in trials 171-175 with that of the first trial, with the median of trials 1 to 5, of 20 to 25, of trials 46 to 50, of trials 76 to 80, and of trials 126 to 130, he got for the 13 tests, average correlations of .41, .61, .73, .77, .85, .92, respectively. Hollingworth concludes: "It is at once evident that the preliminary trial is by no means always a measure of the final relative capacities of the individuals tested. . . . As the trials proceed, then, the relative positions of the thirteen individuals became more and more definitely fixed, but in the beginning the indication is obscure."

Forthwith Hollingworth calls into question the reliability of determining an individual's capacity on the basis of one or a dozen trials at tests, and he states that in case numerous trials are not expedient, only those tests should be used whose results in initial performance correlate very highly with the performance after a very large number of trials. For real diagnostic value he has the conviction that "we shall find it necessary to determine the individual's limit of practice in the various tests before we shall secure diagnostic results which will be verified by the individual's subsequent achievement in daily life."

Certainly the desirability of determining the individual's maximum capacity in any test is undoubted. Hollingworth's assumption, however, that the 171-175 trials represent the highest capacity of the subjects may be questioned. His results merely measured what the individuals *did* on those trials. The learning curve in card-sorting reported elsewhere clearly shows that when on the twentieth trial of the two days the writer told the subjects that it was the last and urged them to do their very best they made a decided spurt considerably above their highest record. This the writer has invariably found for several terms with the card-sorting test used as a regular class experiment. Several performers said they could scarcely drive themselves to the task on the third day's performance because of the monotony of the task. Suppose they had repeated the task 200 times. Even then a "desirable prize" at the end would not, perhaps, say on the 100th trial, be much more incentive to work their very best than would a promise of heaven at 80, be an incentive to a boy of 10, to be good.

In a study of Rivalry the performer, in spite of himself, tended to vary with his rival.[5]

[5] School and Society. To appear shortly.—Hazel Coburn, Helen Collins and Garry C. Myers.

Morgan's[6] study of lifting unseen weights well shows that what a subject does is not a certain measure of what he can do. Adaptation to drudgery, attitude, susceptibility to motivation and willingness to keep at the job, naturally would become more effective factors after many trials than in the early stages of the race. Perhaps the later trials measure these factors rather than mere capacity to do the work.

The fact that those subjects who knew their own and one another's rate of progress shifted relative rankings in the group far more than those to whom all rates were unknown, suggests factors at work other than mere capacity for the task. Indeed it is pretty safe to assume that all other things being equal the performer works the hardest at or near the outset of a task.

Had Hollingworth correlated the first or fifth trial with each of the others he would have found a descending instead of an ascending correlation. A much better case he might have made, too, could he have shown that on the 130th trial the subject's ranking in the tests correlated more closely with their intelligence than did their 1st or 5th trial. The writer computed such correlations for card sorting in class 16.

Correlation of Intelligence with	
Initial performance	−.14
Median first 5	+.13
Median fourth 5 (End 1st day)	−.29
Median eighth 5 (End 2nd day)	+.07
Median twelfth 5 (End 3rd day)	+.18
Median fourteenth 5 (Final five)	+.07

These correlations, all of which practically fall within the P.E., reveal no definite change with practice.

What then is the *relation of card sorting to intelligence?*

The initial average record per 25 seconds for the group 16 which is a marked ability class selected from among about 100 students, is 22.8 cards; average of the 1st 5, 26.9. For class 10 (a regular class) the corresponding figures are 21.8 cards and 27 cards. The initial performance of the 8 ranked highest for general intelligence (class 16) was 20.7 cards, of 8 ranked lowest 28.1 cards.

From these data and from the above correlations there seems to be no relation between general intelligence and card sorting ability.

[6] The Overcoming of Distraction and Other Resistances. Archives of Psychol., No. 35, Science Press.

What is the relation of highest gain in card sorting to general intelligence?

The greatest gain by class 16 was 105 per cent.; by class 10, only 94 per cent. (The highest record appeared from the fourteenth trial upwards.) The gain of the last or 70th performance over the first was for class 16 (of marked ability), 76 per cent.; class 10, 61 per cent. The 8 best in general intelligence gained 129 per cent.; the 8 poorest, 81 per cent. On the last trial, the gain per cent. by the 8 best and 8 worst was, respectively, 94 and 58. The gain of the average of the last five trials over the average for the first five is, for class 16, 30 per cent.; for class 10, 20 per cent. The greatest gain and the gain on the last trial correlated with intelligence, +.48 (P.E. .129) and +.34 (P.E. .149), respectively. Between the highest gain for the 70 trials and the highest gain for the first 20 trials there was a correlation of +.66 (P.E. .095). Doubtless, then, a very certain test of intelligence is the capacity to gain. Whereas with the actual performance there was no relation to intelligence, but at the same time a good positive correlation with gain in performance, a problem of good promise would be to determine how much the relative correlation with gain would be changed if the performance per se were a strong measure of intelligence.

Colvin[7] found a similar measure of intelligence.

Five normal children were paired with 5 subnormal children of the same mental age and given the Cancellation (a) test. "A comparison of the learning curves showed that in every case the normal child made greater improvement with less fluctuation than did the subnormal child."

Later Strong found that whereas 4th grade normal children in 14 days' drill of 2 minutes, advanced from 38 simple addition combinations to 66 such combinations, a class of defective children of the same age but still in the 2nd grade advanced only from 7 to 14 such problems. He concludes that the shape of the curve base on simple arithmetic performance correlates considerably with general intelligence.[8]

Does the performer who attains the highest maximum tend to gain most?

Class 16 were ranked on the basis of their maximum single performance regardless of the trial in which this performance occurred and in like manner on the basis of the greatest total

[7] Notes on Certain Aspects of Learning. As determined by the Binet Tests. *Psychol. Bull.*, 12, 1915: 67-68.

[8] The Learning Curve as a Diagnostic Measure of Intelligence. *Psychol. Bulletin*, 1917, 14: 153-154.

gain per cent. These two rankings correlated +.57. The average gain for the 3 performers who attained the highest maximum records was 50 per cent.; for the 3 who attained the lowest maximum only 21 per cent. The question, then, is answered affirmatively.

Does the performer who reaches the highest point tend to end best?

The ranking of the maximum performances with that of the 14th or last five-group correlates +.64. Again there is an affirmative reply.

Does the performer who reaches the highest point tend to start best?

The correlation between the rankings in question here is +.43. It would seem, therefore, that the final performance is a better measure of the maximum performance (last five) than is the initial (first five) performance. The difference, however, is negligible in the light of the exceptional mode of performance by X noted above. The correlation for the other 15 performers is +.79.

Do individuals of a group become more or less alike with practice upon the same work?

Here all 27 subjects were studied. The M. V. of the several subjects from the average, for each succeeding performance was obtained. Then the median of each succeeding group of 5 M. V.'s divided by the median of the averages for these respective groups was considered the measure of variability among the performers. These 14 succeeding ratios are: .11, .13, .12, .14, .11, .14, .11, .12, .13, .16, .14, .14, .13, .14. Likewise the variability for cube fitting, among the several individuals for the 23 successive single trials divided by the average was as follows:

RATIO OF M. V. (FROM AVERAGE FOR EACH SUCCESSIVE PERFORMANCE) TO AVERAGE PERFORMANCE FOR EACH TRIAL

Trial	1	2	3	4	5	6	7	8	9	10
When subjects knew	.08	.13	.14	.13	.13	.11	.10	.08	.10	.12
When subjects did not know	.12	.13	.12	.12	.10	.07	.11	.12	.13	.10

Trial	11	12	13	14	15	16	17
When subjects knew	.21	.09	.12	.10	.11	.07	.12
When subjects did not know	.15	.09	.09	.09	.11	.09	.11

Trial	18	19	20	21	22	23
When subjects knew	.07	.09	.08	.09	.15	13
When subjects did not know	.12	.09	.10	.15	.12	.12

Thorndike[9] in like manner found about the same ratio of M. V./Ave. at the beginning and end of practice in mental multiplication of one three place number by another.

From these data one cannot say whether practice makes individuals more or less alike.

Does an individual become more or less consistent with practice?

The group of ten were studied on this point. Each individual's records were studied in series of 5 records. The variability was computed from the median of each successive 5 trials and the M. V. was derived; this divided by that median was the chosen measure of variability. The averages of these ratios by the class for the successive 14 fives are: .085, .044, .048, .049, .047, .052, .037, .055, .051, .033, .041, .050. .049, .053. Although there is a drop from the first five to the second five, thenceforward there is no appreciable loss or gain in individual variability. Therefore it seems that whereas the individual becomes a little more regular in performance after a few trials this regularity is not improved by further practice. Furthermore, influence on variability by the length of intervals between test days is not at all revealed by these data.

In this respect Woodworth (Mimeographed Notes, p. 19) points out that while, to ordinary observation, practice makes an individual more regular Ruger's data on puzzle solving suggest uncertainty on this subject. On the other hand Hollingworth speaks of decreased individual variability with practice for his subjects. (Vocational Psychology, p. 251.) Certainly more data on this point are desirable.

For the 10-group the ranking for the greatest gain per cent. correlated with the ranking in smallness of variability gives —.28, P.E. .20. Apparently then there is no relation between regularity of the performer and his degree of progress, as applied to card-sorting.

Conclusions

1. The relative ranking of individuals of a group working at the same task over a long period of time, tends to remain pretty generally the same. The first five performances are as good measure of the remaining 13 five trials as are the last five trials of all others. After a few trials there is no certainty that any performance more definitely measures capacity than any other. Native capacity is pretty strongly evidenced.

[9] *Amer. Jour. Psychol.* 1908, 19: 374.

2. There is practically no correlation between card sorting and intelligence, at any stage in the series of practices.

3. The correlation of the highest gain in card sorting, with intelligence, is +.48.

4. There is a positive correlation

a. Between maximum performance and maximum gain (+.57).

b. Between maximum performance and final performance (+.64).

c. Between maximum performance and initial performance (+.43).

5. Practice does not make the individuals more or less alike.

6. Practice after the first few trials does not make the individual a less regular performer.

7. No correlation obtained between regularity and gain in performance.

8. Doubtless one or a few trials in the average mental test is about as good as an infinite number of trials.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF VASSAR COLLEGE

XXXIV. A Further Study of Freshmen

By Margaret Montague, M. M. Reynolds, and M. F. Washburn

In this Journal for January, 1917, a report was made of the results of a questionary investigation and of certain tests applied to Vassar Freshmen of the class of 1918. The same questionary has been used for succeeding Freshmen classes, and tests have also been made, some of them identical with those used on the Class of 1918, others different. The present paper will give a brief statement of certain results from the classes of 1919 and 1920.

For the class of 1918, correlations by the presence and absence method were calculated from the answers to the questionary.

(1) It was found that "a slight negative correlation (—.21) appeared between interest in mathematics and fondness for writing." For the class of 1919 this negative correlation was larger (—.38), and for the class of 1920 larger still (—.51). In both cases the size of this coefficient is due chiefly to the large class of individuals who say they dislike mathematics and like to write. Thus the chances are about even, in both 1919 and 1920, that a person who likes mathematics will like to write (40:38 in 1919, 35:32 in 1920); they are one to three (35:108) in 1919 that a person who likes to write will like mathematics, and one to two and a half (40:99) in the class of 1920. They are almost exactly even for both classes that a person who dislikes writing will like mathematics (42:38 for 1919, 32:32 for 1920). Thus it seems clear that the proportion of students who say they dislike to write but they like mathematics is decidedly greater than the proportion of those who say they like to write and like mathematics.

(2) For 1918, "a slight negative correlation (—.18) obtained between enjoyment of poetry and fondness for manual work," according to the questionary replies. For 1919, this coefficient is also negative (—.76), but for 1920 it is positive (.43), and in both cases it is without significance because the number of those who like both poetry and manual work is so much greater than that of those who dislike both.

(3) As for the class of 1918, so for 1919 and 1920, no correlation was found between interest in science and a tendency to observe one's surroundings.

(4) For 1918, "The highest positive correlation, one really significant, obtained between the claim to accurate verbal memory and the possession of oral fluency in recitation. It was .41." That is, this was the correlation between the numbers of students who in response to the question, "Can you readily remember the exact words of anything heard?" answered "Yes," and those who in response to the question, "Do words come to you readily, or with especial difficulty in an oral recitation?" answered "Readily." This positive correlation was confirmed for 1919 (.54), and for 1920 (.45). The distribution

of cases was as follows. In both 1919 and 1920, of those who claim accurate verbal memory, from two to three times as many say they are fluent in oral recitation as say the contrary. In both 1919 and 1920, the number of those who say they are not fluent in oral recitation and confess to poor verbal memories is three times that of those who are not fluent but have good verbal memories. On the other hand, the ratio of those who admit poor verbal memory but claim fluency in recitation, to those who admit poor verbal memory and lack of fluency, is more nearly unity for both 1919 and 1920 (53:69 for 1919, 67:79 for 1920). And the ratio of those who say they are fluent in recitation and have accurate verbal memories to those who say they are fluent but have poor verbal memories is also not very far from unity (60:53 for 1919, 67:48 for 1920).

(5) No significant correlation appeared between the answers to the questions, "Do you work better in the morning or the evening?" and "Can you readily turn from one task to another."

On the whole, the answers to the questionary thus presented to three Freshman classes give ground for the following statements:

A student who reports that she dislikes to write is much more likely to say she is interested in mathematics than is one who reports that she likes to write.

A student who says she has accurate verbal memory is much more likely to say that she is fluent in oral recitation than is a student who admits a poor verbal memory.

A student who says she is not fluent in oral recitation is much more likely to say that her verbal memory is not accurate than is one who claims fluency.

We have also some data to report concerning certain tests.

(1) The test of verbal memory used for the class of 1918 (the Cicero passage, Whipple, volume II, page 209, read aloud to the observer) was used for the classes of 1919 and 1920. The testing was as for 1918 done by about thirty students, members of an advanced class in psychology, but all the testers had carefully prepared written directions and gave no instructions to the subjects except such as were supplied them on the direction papers. The results of this test were as follows: For 1919, average 37.2 words, highest score 79, lowest 12, S. D. 13. For 1920, average 37.1, highest score 84, lowest 12, S. D. 12.5.

The relation between this test and academic performance in the Freshman year was studied by finding the average academic grades of the students who fell in the highest quartile according to the test, and the average for those who fell in the lowest quartile. The highest possible grade for the Freshman year being 90, the average grade for the highest quartile was, in 1919, 58.3; in 1920 74.2. The average grade for the last quartile was in 1919, 42.3, in 1920 51.4. Thus the difference in grades was for 1919 16, for 1920 22.8.

In the autumn of 1917, the beginning of the senior year of the class of 1918, we calculated the average class standings for three years of the members of 1918 who had fallen in the first and last quartiles of this test. The difference was found to be only 21.8 in favor of the first quartile, or about ten per cent of the average standing of the last quartile. This difference was somewhat less absolutely than the corresponding difference in 1918's Freshman year, which was 24; it was of course much less relatively.

At the same time, we determined what per cent of students in the

first and last quartiles respectively had withdrawn from college for any cause whatever. 26.6% of the last quartile had withdrawn; 19% of the first quartile: a difference of 7.6% in favor of the first quartile.

(2) For the Cicero passage as a test of memory for ideas the scores were:

For 1919, average 25.8 ideas, highest score 61, lowest 8, S. D. 10.2. For 1920, average 24.5 ideas; highest 49, lowest 6, S. D. 8.

The difference between average academic grades of the first and last quartiles was, for 1919, 13; for 1920, 17.8.

(3) For the Reading Backwards Test, the scores were:

For 1919, average, 368.2 seconds; quickest score, 135″; longest, 1029″; S. D., 84. For 1920, average, 324.9 seconds; quickest score, 121″; longest, 685″; S. D. 77.

The difference between the average Freshman records for the first and last quartiles was, for 1919, 12.9; for 1920, 16.4.

An examination of three years' academic records for the class of 1918 showed a difference of 22.1 points between first and last quartiles in this class. This was only a few points larger absolutely than the difference between the Freshman records of these two groups, which was 19 points, and of course it is much smaller relatively.

Of the students in the last quartile of the Reading Backwards Test in the class of 1918, 35% withdrew before the beginning of their senior year; of those in the first quartile 19.4% withdrew; a difference of 15.6%.

(4) The Hard Directions Test, which was used with the class of 1918, was reported as giving the smallest difference between the academic grades of the first and last quartiles in the Freshman year. It was not used on 1919 and 1920. Examination of the three years' academic records of 1918 showed that this test was decidedly below either the memory tests or the Reading Backwards Test as a prophet of academic success. The difference between the average grades for three years of students in the first and last quartiles of this test was only nine points. Further, of the students in the first quartile 32.6% withdrew before the beginning of the senior year, while of the last quartile only 26.5% withdrew, a difference of 6.6% in favor of the worst quartile.

(5) A test of suggestibility was given to the Freshmen of the class of 1920; namely, the picture of the Butcher's Shop, with the questions used by Healy and Fernald.

The average number of suggestions resisted out of 10 was 8.9; the highest number of course 10, the lowest 3, the S. D. 1.2. The average academic grade for Freshman year of the first quartile was 58.7; for the lowest or most suggestible quartile it was 61; a difference negligible in amount.

(6) The Freshmen of the class of 1919 were given a free association test, with the first fifty words of the Kent-Rosanoff series, the number of egocentric reactions according to the categories laid down by Wells[1] being counted. There was found to be practically no difference between the academic grades of the quartile showing most egocentric reactions and that showing fewest.

(7) The Thurstone Reasoning Test A was given to the Freshmen of the class of 1920. The scoring was done in terms of the average time for correct criticism of a single argument. The average time

[1] *Psychological Review*, volume 18, pages 329-333.

was 29.8 seconds, the quickest time 10.3 seconds, the slowest 81.6 seconds, the S. D. 11.8 seconds. The average Freshman grade of the best quartile in this test was 67; that of the poorest quartile was 51.8: a difference of 15.2.

(8) In the class of 1918, of those in the first quartile in *two or more* tests (21 persons), 15% withdrew before the beginning of senior year. Of those in the last quartile in two or more tests (16 persons), 40% withdrew.

From these results it appears that:

(a) Both the verbal memory test and the Reading Backwards Test are better than the Hard Directions Test as an index of probable academic success. The Hard Directions Test is no index at all.

(b) There is no relation between academic success and suggestibility (as shown in the recall of details of a picture), or tendency to make egocentric reactions in a free association experiment.

(c) The relation between success in Freshman tests and academic success in three years work is decidedly less than that between success in Freshman tests and academic success in the Freshman year. Since this statement refers to groups, that is, to first and last quartiles, rather than to individuals, one reason for the difference is clearly that more of the last quartile than of the first quartile withdrew before completing three years of college work, so that the groups compared at the beginning of senior year are less nearly equal in size and probably more nearly equal in ability.

(d) Failure to get above the lowest quartile in two or more Freshman tests indicates nearly equal chances that the student will withdraw before the beginning of senior year.

XXXV. Further Tests of the Verbal Ability of Poor Spellers

By Margaret E. Cobb, Margaret Kincaid, and M. F. Washburn

In a study ("Accuracy of Visual Memory and Speed of Verbal Perception in Poor Spellers," this Journal, vol. 28, page 157), published in 1917, it was shown that a group of 'constitutionally' poor spellers were inferior to an equal group of good spellers (1) in the accuracy of immediate recall of visual non-verbal material, and (2) in the speed with which words were recognized, as measured by performance in the Reading Backwards Test. The two groups were about equal in their performance of a test of visual-verbal memory, where the material, of course, could readily be translated into auditory terms. Hence the existence of slight defects (1) in pure visual immediate memory and (2) in the ability to recognize words was suggested. The present study aimed to investigate further the possible existence of a defect in dealing with verbal material: an inability to perceive words readily and accurately.

Each member of a group of fifty-eight bad spellers, reported by the English Department, and each member of a group of sixty good spellers, was given two tests. The first was the familiar word-building test, where the observer is asked to form as many words as possible out of the letters a, e, o, b, m, t.

For the second test, a passage of one hundred words of prose was selected. The observers were asked to copy the passage as rapidly and accurately as possible. The time required was taken with a stop-watch. They were then asked to make with pen or pencil 100 loops half an inch high, as rapidly as possible, and the time required for this was measured in the same way. In the case of each individual, the time for copying the passage was divided by the time required to make the loops, and the quotient was regarded as measuring indirectly the time required by that individual to perceive and react with appropriate writing movements to the words of the passage. That is, it was argued that the purely mechanical execution of writing movements was represented by the loop making; that writing words would require a certain average multiple of the loop-making time, and that quotients of loop-making time into copying time below or above this average would point to variations in the processes peculiar to the copying of words rather than the making of loops.

The results of test (1) were as follows. The good spellers made on the average 22.9 words from the letters, with a mean variation of 3.6 words. The bad spellers made an average of 19 words, with a mean variation of 3.4 words. The distribution of the scores showed a real superiority in word-building on the part of the good spellers. Scores between 10 and 15 words were made by 9 bad spellers and 1 good speller. Scores between 15 and 20 were made by 23 bad spellers and 16 good spellers. Scores between 20 and 25 were made by 19 bad spellers and 28 good spellers. Scores between 25 and 30 were made by 8 bad spellers and by 10 good spellers. Scores between 30 and 35 were made by no bad spellers, and by 4 good spellers. These figures indicate also that very poor performance in word-building is more

nearly peculiar to bad spellers than very good performance is of good spellers.

The results of test (2) showed an average quotient of copying time divided by loop time of 5.4 seconds, m.v. 1.2, for the good spellers, and 5.99 seconds, m.v. 1.2, for the poor spellers. The individual results, however, are distributed in a way which shows no real superiority for the good spellers. This distribution was as follows. Quotients 2.25 to 2.5, one good, one bad speller. Q. 2.75 to 3, one bad speller. Q. 3-3.25, four good spellers. Q. 3.25-3.5, one bad speller, four good spellers. Q. 3.5-3.75, one bad speller. Q. 3.75-4 one bad speller, six good spellers. Q. 4-4.25, one bad speller, two good spellers. Q. 4.25-4.5, one bad speller, two good spellers. Q. 4.5-4.75, three bad spellers, one good speller. Q. 4.75-5, four bad spellers, one good speller. Q. 5-5.25, five bad spellers, four good spellers. Q. 5.25-5.5, three bad spellers, seven good spellers. Q. 5.5-5.75, five bad spellers, two good spellers. Q. 5.75-6, two bad spellers, six good spellers. Q. 6-6.25, five bad spellers, one good speller. Q. 6.25-65, seven bad spellers, four good spellers. Q. 6.5-6.75, four bad spellers, three good spellers. Q. 6.75-7, two bad spellers, six good spellers. Q. 7-7.25, two bad spellers, no good spellers. Q. 7.25-7.5, three bad spellers, three good spellers. Q. 7.5-7.75, one bad speller, no good spellers. Q. 7.75-8, no bad spellers, one good speller. Q. 8-8.25, three bad spellers, one good speller. Q. 9-9.25, no bad spellers, one good speller. Q. 9.75-10, one bad speller, no good spellers. Q. 16.8, one bad speller.

The larger the quotient, the poorer, according to our argument, the verbal perception. The scattering of these results, however, shows that the test failed to bring out any characteristic difference between the good and bad spellers in this respect. It is quite possible that the time required for making loops is not a fair representative of the speed of the mechanical processes in writing. A person who can make loops fast, that is, may not necessarily be a person who can execute rapidly the more complicated movements of writing words. Thus our quotients may have contained differences due to purely mechanical writing processes.

The study shows that good spellers have greater verbal ability than bad spellers, as measured by the number of words they can construct out of a given set of letters.

XXXVI. Experiments on a Possible Test of Aesthetic Judgment of Pictures

By Judith Cattell, Josephine Glascock and M. F. Washburn

The following study represents a preliminary exploration of one part of the field mentioned in the title. The materials used were thirty-six Cosmos prints in black and white of the following pictures:

1. Holbein: The Ambassadors.
2. Thorn: Song Without Words.
3. Ruysdael: Forest of Oaks.
4. Delobbe: Noonday Rest.
5. Holbein: Madonna of the Meyer Family.
6. Berne-Bellecour: The Intended.
7. Haquette: Departure of the Fishing Boat.
8. Hofmann: Jesus and the Woman of Samaria.
9. Alma Tadema: Sappho.
10. Naujok: St. Cecilia.
11. Millet: The Gleaners.
12. Plockhorst: Christ Blessing Little Children.
13. Mauve: Sheep, Spring.
14. Knaus: Holy Family.
15. Dicksee: Young Handel.
16. Gardner: David the Shepherd.
17. Holman Hunt: The Shadow of the Cross.
18. da Vinci: The Virgin of the Rocks.
19. Raffaelino: Madonna with Angelic Choir.
20. Turner: The Fighting Temeraire.
21. Piglhein: Star of Bethlehem.
22. Murillo: Children of the Shell.
23. Piloty: Thusnelda.
24. Frise: Reconnaissance by Lions.
25. Del Sarto: Madonna of the Harpies.
26. Del Sarto: Entombment.
27. Murillo: Madonna.
28. Ver Meer: Young Lady with Pearl Necklace.
29. Holmes: Kiss Me.
30. Boughton: Two Farewells.
31. Douglas: Jersey.
32. de Hooch: Dutch Interior.
33. Haquette: The Return to the Port.
34. Aubert: Cupid's Convention.
35. Thumann: The Fates.
36. Gardner: An Improvised Cup.

These pictures were chosen to represent as wide a range as possible, from the sentimentally popular to the technically great. The titles and the names of the artists were removed from the pictures before they were used. They were then put into the hands of the three experts in the Vassar department of art, Messrs. O. S. Tonks, A. E.

Bye, and Clarence K. Chatterton. These gentlemen, for whose co-operation we wish to express our thanks, were asked to arrange the pictures in the order in which they would choose to own the originals (the financial value of course being left out of account). From the ranks which these three authorities assigned a picture the average rank of that picture according to expert judgment was computed; and thus a combined ranking, the standard ranking, was obtained for the whole series of thirty-six. The order, beginning with the highest, of the pictures in this standard ranking was as follows: 11 and 28 (equal), 13, 20, 32, 18, 5, 1, 26, 25, 17, 22, 19 and 9 (equal), 3, 27 (here a considerable drop in the average rankings occurred, indicating that the pictures below this point were considered by the experts as markedly inferior to those above it), 23, 6, 14, 24, 12, 15, 10 and 7 (equal), 8, 16, 21, 35, 33, 34, 36, 30, 4, 31, 2, 29. The average deviations of the three experts in their judgments of the rank of a particular picture ranged from 7.8 places down to .4 of a place, and the average of these averages for all the pictures was 3.4 places.

One hundred and forty-four women student observers were now required successively to perform the same experiment; that is, to rank the thirty-six pictures in the order in which they would be, for their own sake, desirable possessions to the observer making the ranking. When each observer had completed her arrangement, she was asked the following four questions: "Have you ever studied drawing or painting? Have you ever studied the history of art? Have you visited many picture galleries? Are you especially interested in pictures?"

The rankings which these one hundred and forty-four observers gave the pictures were treated in two ways. First, a rank-difference correlation was obtained between each observer's rating of the pictures and the expert rating. These correlations varied from +.82 to —.42; their average was +.19, with a mean variation of .26. Then, secondly, a combined ranking of the pictures for all the one hundred and forty-four observers was obtained, by averaging the ranks assigned by all the observers to one picture, repeating this process for each of the other pictures in turn, and ranking the pictures on the basis of these averages. A rank-difference correlation was then found between this ranking (which we shall call the 144 O. ranking) and the expert ranking. The correlation was found to be +.33, with a probable error of .10.

Three small groups were then selected from the total number of observers, seventeen in each group. The first group was composed of observers who answered "yes" to all the questions, and therefore represent those most artistic in training and taste. A combined ranking from Group I showed a rank-difference correlation with the expert ranking of +.49, probable error .09. Group II contained the observers who answered "no" to all the questions, and thus might be considered the least artistic. The ranking formed from their combined judgments gave a correlation with the expert ranking of —.11. Group III contained observers who answered "yes" only to the last question; that is, they were without artistic training of any sort, but were interested in pictures. The correlation of the ranking formed from their combined judgments and the expert ranking was +.43, nearly as high as that of Group I.

Some interesting points of difference appeared between these three groups as regards the average rank which they assigned to particular pictures. We have seen that the experts placed picture 11 (Millet's Gleaners) and picture 28 (ver Meer's Young Lady with Pearl Neck-

lace) together at the head of the list; picture 13 (Mauve's Sheep) stood next; picture 29 (Holmes: Kiss Me) was at the foot, and picture 31 (Douglas: Jersey) ranked next but one to the last. Now in the combined ranking of all 144 observers, picture 13 stood at the head and picture 31 at the bottom. Group I (the artistic), also put 13 at the top and 31 at the bottom. Group II (the wholly inartistic), put 13 at the top; but at the bottom they put number 1, Holbein's Ambassadors, which the experts rated as eighth from the top. Group III, the observers who were untrained but interested in pictures, approached more nearly to the experts in putting picture 11 at the top; 31 being at the bottom.

It thus appears (1) that technical training makes the rankings assigned to these thirty-six pictures correlate more closely with the rankings assigned them by experts, which might have been expected; and (2) that a declared interest in pictures, quite apart from any kind of training, has a noticeable effect in producing closer approximation of the judgments to those of experts.

As the results were further studied, it became apparent that the rating given by an individual to one or two pictures out of the thirty-six was of marked significance as showing that individual's agreement with the expert standard. This was noticeably true of picture 28, Ver Meer's Young Lady with Pearl Necklace, which the experts put at the top of the list. This picture has but little literary appeal; its excellence is in a high degree technical. Its rank in the combined 144 O. ranking was 20; the totally inartistic group II placed it as low as 30; the highly artistic group I put it at 12, and the untrained but interested observers of group III again showed the effect of their natural taste by rating it at 16.

Other indications of the diagnostic significance of an observer's reaction to picture 28 were obtained from a study of the indexes of correlation between a given individual's ranking of the pictures and the expert ranking. There were fifty-nine persons who gave either negative correlations or positive correlations less than +.10. The rankings which these persons gave to picture number 28 were well massed beyond twenty: there were eleven who put it at the bottom of the scale and only six who ranked it better than twentieth: the average ranking was 28.3. There were forty-one observers who had positive correlations of over 40; the ranks which these assigned to picture 28 were massed at the upper end, there were only five who ranked it beyond eighteen, and the average ranking was 8.8. Thus a difference of 19.5 places appeared between the average ranking of 28 by the observers whose ranking of the whole series of 36 pictures failed to correlate or correlated negatively with the expert ranking, and the average ranking of 28 by the observers whose ranking of the whole series correlated with the expert ranking by more than +.40. These results may be compared with those for picture 11, Mauve's Sheep, a picture which is attractive in subject as well as in technique. The massing of the rankings of this picture was at the upper end in the case of both the low correlation groups and the high correlation groups; the average ranking for the low correlation group was 6.8, that for the high correlation group 5.3, a difference of only 1.5. In other words, everybody liked this picture.

Further, we looked up the indexes of correlation for the individuals who had assigned rankings from 26 to 36, or the last ten ranks, to picture 28, and found that out of 53 individuals only five, or 9.4%, had correlations of over +.40. Of the 32 individuals who assigned to picture 28 a rank somewhere among the first ten places, there were

only 12, or 32.4%, who had correlations below +.40. It would seem that assigning a low rank to picture 28 is a better indication of poor artistic judgment than assigning a high rank to this picture is of good artistic judgment.

Finally, another expression for the diagnostic significance of the rank which an observer assigned to picture 28 was sought in the following way. An average was taken of the indexes of correlation obtained between the ranking of the whole series of thirty-six pictures and the expert ranking, for all the observers who assigned rank number 1 to picture 28. A similar average of the coefficients was made for all the observers who assigned rank number 2 to picture 28, and so on for each of the thirty-six ranks that could be assigned to this picture. Of course the number of observers assigning the same rank to picture 28 was not equal for all the ranks; it varied from twelve (for the lowest rank, 36) to one (for ranks 16, 19, and 30), so these averages were not very significant. But if the judgment made on picture 28 were a perfect index of the degree of correlation between an observer's ranking of the thirty-six pictures and the expert ranking, so that one could predict the correlation from the judgment on this one picture, evidently the averages of the indexes for observers who made the same ranking of picture 28 ought, when arranged in numerical order, to follow the order of the ranks assigned to 28. Thus, the average of the correlation indexes of the observers who ranked picture 28 as number 1 ought to be the highest average; that of the observers who ranked picture 28 as number 2 ought to be the next highest, and so on down. A rank difference index of correlation was accordingly found between the thirty-six average indexes and the order 1 to 36, and this coefficient was found, in spite of the inadequacy of the averages, to be +.78. Thus it would appear that if this series of pictures is used, ranking picture number 28, ver Meer's Young Lady with Pearl Necklace, anywhere in the last ten places means in nine cases out of ten low correlation with the expert judgment on all the pictures; ranking it among the first ten places means in two cases out of three high correlation with the expert judgment on all the pictures.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY.

Communicated by E. B. TITCHENER and H. P. WELD

XLII. THE PSYCHOLOGICAL ATTITUDE OF CHARLES DICKENS TOWARD SURNAMES

By E. DE LASKI

This paper is one of a series begun by Kollarits[1] and Claparède,[2] and continued by English[3] and Alspach,[4] on the psychological response to proper names. Kollarits and English have made out the associative factors which condition the response, the latter finding in particular that, except perhaps in the case of highly responsive observers, the mere sound of the name is not an important factor. Since this result was contrary to a suggestion of Claparède's, English proposed two problems for further investigation: (1) a detailed analysis of the reactions of highly responsive observers, and (2) a psychological examination of the proper names employed by certain writers of fiction. Alspach undertook the first of these studies in the case of a single observer; and we now report a study of the second problem as regards a single author.

We selected Charles Dickens, partly because Claparède had said that this author among others invented names which by their physiognomy suggested particular types of persons, and partly because there seems to be a general belief that Dickens was highly successful in choosing names which suited his characters. This is, indeed, the general conclusion reached by Gordon, who has written a monograph on the subject.[5] There are, however, two points of view here involved which should be clearly distinguished. It is one thing to ask whether a proper name in and of itself may suggest a particular type of individual (Claparède's question), and it is quite another thing to ask whether a given name suits a character whose attributes are known (Gordon's inquiry). In the former case, the name alone is given and the associations are free; in the latter, both name and character are given for comparison, and the associations are therefore controlled. As method, the second procedure is full of pitfalls; not only do old associations stand in the way but, given the laws of Similarity and

[1] J. Kollarits, Observations de psychologie quotidienne, *Arch. de psychol.*, xiv, 1914, 225-240.

[2] E. Claparède, *ib.*, 301 f.

[3] G. English, On the Psychological Response to Proper Names, This Journal, xxvii, 1916, 417-434.

[4] E. Alspach, *ib.*, xxviii, 1917, 436-543.

[5] E. H. Gordon, The Naming of Characters in the Works of Charles Dickens, *Univ. of Nebraska Studies in Language, Literature and Criticism* (Lincoln, 1917). We do not wish to imply that this paper is open to the following general criticism of method. The author has been cautious, and her paper is highly suggestive.

Contrast, one can argue to the suitability of any name to any character.

The study of an author's psychological attitude to proper names is, of course, a much broader problem. We must inquire first of all into the source or origin of his names; and if we find that he constructed them, then we must discover, if possible, his method. Next, we must examine them as significant, and find out if we can what associative factors conditioned their employment. Then we may attempt a characterization of his attitude. We have found it impossible to carry this programme through all of Dicken's works; and we have, therefore, restricted our examination to The Pickwick Papers and Nicholas Nickleby as representing the novels of his earlier, and Our Mutual Friend as representing those of his later period.[6]

Origin of Dickens' Surnames

Our positive information concerning Dickens' method of finding names for his characters is slight. We know only that in his 'memoranda' was a list of christian names selected from Privy Council Education Lists; that there was also a list of 'available names' from which he made selections for the novels between Little Dorrit and Our Mutual Friend inclusive;[7] that in some instances he borrowed the names of known persons and places;[8] that in other instances a name passed through a transition of several changes in spelling before the final form was hit upon;[9] and, finally, that occasionally he used nicknames which he had invented for intimate friends and his children.[10]

These facts make it probable that Dickens borrowed more English surnames than is generally supposed. Accepting this supposition as a hint of method, we set out first of all to determine how many of Dickens' surnames are in fact British surnames. In the course of this search, we discovered a large number of the former which differ from the latter only in suffix: the stems are the same, but by addition, subtraction, substitution, or slight change in spelling, the terminal formatives have been altered. We accordingly listed these as names 'derived from British surnames.' We have, however, also included under this category the few instances of agglutination, and the still rarer cases where the stem itself undergoes a slight change in spelling. Working thus by a method of elimination, we next subtracted those names also which are English words, and those which are 'derived from English words.' We were then left with a 'remainder,' some of which are drawn from various traceable sources, while others are of questionable origin.[11] The list by novels under the above categories, and a quantitative summary in the form of a table, follow.

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[6] *Pickwick Papers* was written in 1836-37; *Nicholas Nickleby* in 1838-39; and *Our Mutual Friend* in 1865. We shall hereafter refer to these works in the order named as P. P., N. N., and O. M. F.

[7] J. F. Forster, *Life of Charles Dickens*, iii, 1874, 262 ff.

[8] Forster, *op. cit.*, i, 1874, 32, 88 note; J. Kitton, *Charles Dickens, His Life, Writings and Personality*, 24; P. FitzGerald, *History of Pickwick*, 86, 153 f, 310.

[9] Forster, *op. cit.*, ii, 1873, 23; Kitton, *op. cit.*, 174 ff.

[10] G. Hogarth and M. Dickens, edd., *Letters of Charles Dickens*, 1893, 101.

[11] The dictionaries to which we have had access are: W. Arthur, *An Etymological Dictionary of Family and Christian Names* (1857); H. Barber, *British Family Names* (1894); C. W. Bardsley, *A Dictionary of English and Welsh Surnames* (1901); H. Harrison, *Surnames of*

PICKWICK PAPERS

British Surnames: Allen, Bamber, Bardell, Brooks, Budkin, Bullman, Bulder, Burton, Clarke, Craddock, Crawley, Cummins, Dodson, Dowler, Edmunds, Fogg, Goodwin, Griggs, Grub, Grundy, Gunter, Gwynn, Harris, Heyling, Hopkins, Humm, Hunt, Hunter, Jackson, Jinks, Lowten, Lucas, Magnus, Mallard, Manning, Martin, Miller, Mudge, Payne, Pell, Pickwick, Pipkin, Pott, Price, Raddle, Rogers, Roker, Sanders, Sawyer, Simpson, Smart, Smithers, Smithie, Snodgrass, Staple, Stiggins, Tompkins, Tomlinson, Trotter, Trundle, Tupman, Walker, Wardle, Weeks, Weller, Wicks, Wilkins, Winkle.

Derived from British Surnames:[12] Ayresleigh (Ayres and Leigh), Bantam (Banton), Beller (Bell, Bellard), Bilson (Biller, Billing), Boffer (Boffey), Budger (Budge, Budgen), Blazo (Blaze, Blazy), Clubber (Clubb), Crookey (Crook, Crooke, Crooks), Dubbley (Dubber, Duberly), Dumkins (Dumville), Fitzmarshall (Fitz and Marshall), Fizkin (Fitz, Fidkin, Fitkin), Hutley (Hutt, Hutson), Lobbs (Lobb), Luffey (Luff), Matinter (Mattin), Mordlin (Mordan, Morden), Mudberry (Mudie, Muddieman), Muzzle (Muzzell), Noddy (Nodder), Perker (Perk, Perkins), Phunky (Funk), Podder (Podd), Ramsey, (Ram, Ramsden), Simmery (Simm, Simmons), Tadger (Tady), Tappleton (Tapp, Tapper), Tuckle (Tuck, Tuckey), Watty (Watt), Whiffins and Whiffers (Whiff), Witherfield (With, Witherow).

English words: Jingle, Namby, Slum, Snicks, Snipe, Smouch, Struggles.

Derived from English words: Blotton, (blot, blotten), Bolo (bolus), Boldwig, Buzfuz, Crushton (crush), Filletoville, Fizzgig, Flasher (flash), Grummer (grum), Mutanhed, Nockemorf, Skimpin(g), Slammer (slam), Slasher (slash), Slumkey (slum), Smiggers (smigg), Smorltork, Snubbin(g), Snuphanuph, Stareleigh (stare), Prosee (prose), Porkenham.

Remainder: Bladud, Cluppins, Donna, Christina, Groffin, Gurgum, Lud, Mivens, Nupkins, Pruffle, Quanko Samba, Slurk, Smangle, Smauker, Slummintowken, Tollimglower, Upwitch, Wugsby. Bladud, son of Lud, is a mythical king, reputed founder of the city of Bath. Christina was queen regent of Spain during the years 1833-40. Slurk and Smangle suggest lurk and mangle. Cluppins, Groffin, Gurgum, Mivens and Nupkins have as stems archaic or provincial words which may have been known to Dickens; cluppe (to embrace) or clop (to hobble), groffe (ground), gurgy (a stubby hedge, Scotch gurg, to make

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the United Kingdom (1912-19-); M. A. Lower, *A Dictionary of the Family Names of the United Kingdom* (1860); L. Wagner, *More About Names* (1893); *id., Names and their Meaning* (1892); E. Weekly, *The Romance of Names* (1914); *id., Surnames* (1916). The Scottish equivalents will be found in A. Warrack, *A Scots Dialect Dictionary* (1911); the obsolete and provincial terms in T. Wright, *Dictionary of Obsolete and Provincial English* (1857), and J. Wright, *The English Dialect Dictionary*, 1898-1905. We have also consulted the slang dictionaries, particularly that of J. S. Farmer and W. E. Henley, but to no avail; Dickens, apparently, did not employ slang in forming surnames.

[12]The names within parentheses are the nearest discoverable British surnames.

a creaking noise), miver, miveys (a mortar, marbles), nup, nupson (fool). Upwitch (Upwich) is a village in Kent.[13]

NICHOLAS NICKLEBY

British Surnames: Adams, Belling, Bevan, Bonney, Bray, Brooker, Brooke, Clark, (La) Creevy, Crowl, Cutler, Digby, Dowdle, Green, Hawk, Hawkins, Jenkins, Jennings, Johnson, Lane, Matthews, Mobbs, Palmer, Pitcher, Pluck, Price, Pyke, Simmonds, Squeers, Thomas, Tompkins, Watkins, Westwood.

Names derived from British Names: Blockson (Block, Blocker), Bobster (Boby), Bolder (Bold), Browdie (Brow, Brodie), Browndock (Brown, Docking), Borum (Borer), Cabbery (Cabble), Chopkins (Chopping), Cobbey (Cobb, Cobby), Cropley (Cropper), Crummles (Crum, Crummock), Curdle (Curd), Dorker (Dorner, Dorling), Folair (Foley, Folgate), Graymarsh (Gray, Marsh), Gregsbury (Greg, Gregson), Gride (Gridely), Grimble (Grimbleby), Knag (Knagg), Kenwigs (Ken, Kendal), Ledrook (Leder, Ledson), Lenville (Leney, Lenain), Linkinwater (Link, Linklater), Lillyvick (Lilly, Vick), Lukin (Luken), Lumbey (Lumby), Marker (Mark), Mogley (Mogford), Muntle (Munt, Mundle), Nickleby (Nickel), Petowker (Peto), Pupker (Puplett), Ruddle (Rudlock), Scaley (Scales), Smifser (Smith, sir), Snewkes (Snooks), Sprouter (Sprout), Timberry (Timbury), Tipslark (Tipler, Lark), Trimmers (Trimmer).

English words: Dabber, Nog(g)s, Snob(b).

Derived from English words: Cheeryble (cheery), Chowser (chouse), Gallanbile, Gazingi, Koeldwethout, Peltirogus (pelt-a-rogue), Pugstyles, Sliderskew (slide, askew), Snuffim, Tix (tics or ticks), Verisopht, Wititterly (wit, titter), Wrymug.

Remainder: Belvawney (bellevue?), Bravassa (bravo), Bulph, Dibabs, Glavermelly, Grudden, Pluggers, Smike, Snawley (snarly), Snevellici (snivel?), Swillenhausen. Some of these are apparently derived from Scotch words: Bulph (bulf, a fat person), Glavermelly (glaver, to chatter, babble), Smike (smicker, to smirk, to smile fawningly); Swillenhausen (swill, to souse; hause, throat).

OUR MUTUAL FRIEND

British Names: Baldwin, Blight, Blogg, Boffin, Brewer, Cleaver, Day, Dancer, Elwes, Goody, Handford, Harmon, Harrison, Holmes, Hopkins, Jardine, Jones, Kibble, Lightwood, Little, Martin, Mullins, Noakes, Owen, Parker, Reid, Sampson, Taylor, Tippins, Tootle, Twemlow, Venus, Wegg, Wilcocks, Williams, Wood, Wren.

Derived from British Names: Akershem (Ackerson), Bocker (Bock), Boots (Boot), Chicksey (Chick), Gliddery (Glide), Hawkinson (Hawkins), Headstone (Head, Stone), Hexam (Hexter), Higden (Higdon), Jarrel (Jarred), Joey (Joel), Lammle (Lammie), Milvey (Milvain), Overs (Over), Peecher (Peacher), Podsnap (Podd, Podmore), Poddles (same), Potterson (Potter, Potterton), Pubsey (Pudsey), Riderhood (Rider, Hood), Rokesmith (Rokester), Radfoot (Radcliffe, Radway), Sprodgkin (Sprodgeon), Stobbles (Stobbs), Tapkins (Taphouse), Toddles (Todd), Twopence (Twopenny, Fourpence), Whitrose (Whitmore), Wilfer (Wilford, Wilful), Wrayburn (Wray, Burns).

[13]For this origin of Upwitch as a Dickens surname, see FitzGerald, *op. cit.*, 86.

English Words: Buffer, Gruff and Glum, Sloppy, Veneering, Glamour, Linseed, Styles.

Derived from English Words: Fledgeby (fledge, fledgey), Snigsworth (snig), Swoshle (swash, swasher, a swaggerer).

Remainder: Riah (Uriah), Grompus (grumpy; Scotch grumph, growl), Sauteuse (dancer).

RELATIVE FREQUENCIES OF THE NAMES UNDER THE VARIOUS CATEGORIES IN PERCENTS

Novel	British Surnames	Derived from Brit. Names	Eng. words	Derived from Eng. words	Remainder
P. P.	47	22	5	14	11
N. N.	33	40	3	13	11
O. M. F.	46	37	9	4	4

An inspection of the above lists and of the quantitative summary shows unmistakeably that a large majority of Dickens' names are either British surnames or easily derivable from them. This does not mean, however, that they were necessarily and knowingly selected as we have classified them. For, in the first place, our categories are not exclusive; a number of good British family names are also good English words; and, as we shall later see, some names which appear in our lists of family names were chosen, primarily at least, for their significance as words. Furthermore, it is logically possible to find still other means of classification, which might prove to be as inclusive as our own. Nevertheless, the fact that of the total of 326 names in the three novels, 74% are British or derived from British family names, and the further fact that less than 10% fail to be subsumed under our four categories, raises a strong presumption that Dickens was not as original in his selection of surnames as is ordinarily supposed.

Dickens, then, did not, apparently, 'invent' names in the strict meaning of that term; he selected names and re-formed them, and he chose meaningful words and constructed names out of them. His favorite device for making new names was, as we have seen, to alter the suffix. In P. P., the new suffixes are principally *er, ers* (13 cases), *y, ly, leigh, ee* (10 cases), *in(s), kin(s)* (6 cases), and *an, am, on* (4 cases). There is only one instance of a word-suffix (*field*). In N. N., the relative frequency of *in, kin* decreases, that of *ly, le* increases, while that of the other syllables remains about the same. There is, however, a decided increase in the number of word-suffixes (*dock, air, bile, wigs, rook, ville, lark*). Finally, in O. M. F., the decrease is in the frequency of *er, ers,* the others remaining at about the same relative frequency; and there is a new list of word-suffixes (*mop, hood, smith, foot, rose, burn, worth*). A second method was to change a given name or word in some way that obscured the original form. Thus the name of the family dog Timberry became Timber; the original nickname of Dickens' son Charley, Master Toby,

was altered into Flaster Floby; and Dickens himself says that Mantalini came in the same way from Muntle. It is, of course, impossible to say how many names in the three novels originated by this method: Riah we are sure of, and we suspect Petowker, Slummintowken, Tollimglower, and Quanko (Sancho).[14] A third contrivance was the ancient trick of making a name out of a pair of words or a phrase spelled more or less phonetically, as *e.g.*, Filletoville, Gazingi, Mutanhed, Peltirogus, Porkenham, Smorltork, Snuphanuph, and Verisopht.

Dickens' Attitude Toward Surnames

In the studies of Kollarits, English and Alspach, the principal associative factors which condition the response to proper names have been found to be five in number: (1) suggestion of nationality; (2) meaning of the word; (3) auditory-verbal associations (Gronch suggests grouch, grunts); (4) suggestion by the mere sound of the name (Claparède's 'physiognomy'); (5) suggestion by the same or similar name (Boppum suggests Bottom). Not all these factors are, however, equally effective for all observers; and we may therefore gain an insight into a particular individual's disposition toward proper names by determining what factors are, for him, the more effectual. We propose to analyse Dickens' attitude in this way. It is true that his procedure was in the reverse order of that of the experiments: *i.e.*, he found a name to suit the character, instead of a character to fit the name. Nevertheless our method is justified. For the experiments have again shown that character and fitting name belong to the same attitude; that the name 'points to' the character, just as the character 'points to' the name. We shall, however, make our results doubly sure by reference, where possible, to other sources than the names themselves.

(1) *Nationality.* There is no doubt that Dickens was disposed for the nationality of names. The context tells us that Quanko Samba was West Indian, that Bolero Fizzgig and Christina were Spanish, that Koëldwethout and Swillenhausen were German, that Sauteuse was French, and that Smorltork was a foreigner. Furthermore, Dickens explains that Mantalini was "originally Muntle, but it had been converted by easy transition into Mantalini: the lady rightly considering that an English appellation would be of serious injury to the business."[15] Perhaps Snevellici (snivel), Belvawney (bellevue?), Bravassa (bravo), and Glavermelly (glaver), all of which are part English and part foreign, were chosen for a similar reason.[16] Finally, since Dickens was writing English stories, it must have been his "feel" for the nationality of a name that led to his reliance on English surnames in good standing and on names derived from them. The trick of retaining the stem and adding a new (but an English) suffix gives to a name, in itself unfamiliar, all the familiarity of an

[14]Gordon suggests that Dickens may also have employed what Weekley terms 'baby phonetics' in the formation of surnames. Thus, Mudge may be a childish pronunciation of Smudge, and Smangle of Mangle. In the former the initial s is dropped, in the latter an inorganic s is added. Gordon, *op. cit.*, 28; E. Weekley, *Romance of Names*, 39 f.

[15]N. N., x.

[16]Alspach's observer reported that a combination of factors may occur in a single name, and that occasionally they may point in opposite directions: *op. cit.*, 438 f.

English name. Despite the general certainty of Dickens' touch for nationality of the name, there are, however, occasional lapses: Fizzgig, for example, is not Spanish, and neither Bolo nor Blazo is characteristically English.

(2) *Meaning of the Word.* The large number of names that are also English words is, in itself, indicative of Dickens' use of the meaning of the word as an associative condition. But there is further evidence in the novels. For example, we read of the "dismal boy whose appropriate name was Blight;"[17] we are told that Buffer, Boots and Brewer are in fact "stuffed Buffers interposed between the rest of the company and possible accidents."[18] Finally, not to multiply instances, Dickens clearly reveals his attitude in this regard by his account of the neighbors' attempt to supply christian names for Wilfer, who signed his name with an R. "Some of these were more or less appropriate: as Rusty, Retiring, Ruddy, Round, Ripe, Ridiculous, Ruminative; others derived their point from their want of application; as Raging, Rattling, Roaring, Raffish."[19] Here we have the traditional laws of Similarity and Contrast. The latter, however, Dickens himself seems to have employed only rarely. The name of Venus is probably one such instance; Lammle, another; and the christian name of Pleasant Riderhood is an anomaly which causes Wegg to exclaim: "Pleasant! Dear me! Seems to express what she might have been if she hadn't made that unpleasant remark—and what she ain't in consequence of having made it."[20]

All told, 82 of the 327 names in our three novels are English words. Thirteen of these, however, are either too common as surnames to be suggestive, or of so little descriptive value as to be insignificant (e.g., Brooks, Hunt, Hunter, Miller, Walker, Wood).[21] On the other hand, there are 63 names which are so like English words as to have all their descriptive value; *e. g.*, Poddles, Toddles, Chopkins, Podsnap, Flasher, Borum, Pupker. There are then 118 names, 36%, that are obviously significant.[22]

(3) *Auditory-Verbal Associations.* The external evidence for the presence of this factor in Dickens is his fondness for rhyming and alliterative names, and for the obscuring changes which we have already noted. The instance in which the judge in Pickwick's trial mistakes Phunky for Monkey is, of course, a case in point. A name which properly belongs to this group is one that readily suggests one or several words which are similar in sound and meaning, and that accords with an attitude common both to the words and to the name. Examples taken at random are: Tadger, badger; Bobster, lobs-

[17]O. M. F., viii.
[18]O. M. F. i, ii.
[19]O. M. F. i, iv.
[20]O. M. F. iii, vii.
[21]In P. P., Dickens forces the meaning of *Hunter* by the prefix *Leo.*
[22]Our criterion for the classification of these names was to accept a name to which a number of American college students responded with the stem, or suffix, or both (as in Podsnap), when instructed to react with the 'first word that came.' The method is arbitrary, but the results check numerically with a classification by derivation (*i.e.*, names derived from English words). We have omitted, however, those names which seemed to be derived from archaic, provincial or Scotch words. If these be admitted as significant for Dickens, then the percentage of names significant for him would be about 40%.

ter; Grompus, grumpy; Grimble, grumble. A prettier instance, one noted by Gordon, is Squeers, which suggests queer, sneer, shear, squeeze, squirm, squeal, etc.[23] There is a 'feel' about these words which, when taken as descriptive, belongs to the 'feel' we have for the character. We have found, again checking our own selections by experiments with a group of college students, 53 of these words, or about 15% of the total.

(4) *Suggestion by Mere Sound of the Name.* Dickens gives direct proof of his 'feel' for the sound of a name in the following protocol: "Reginald Wilfer is a name with rather a grand sound, suggesting on first acquaintance brasses in country churches, scrolls in stained-glass windows, and generally the De Wilfers who came over with the Conqueror." And he gives indirect evidence in the names themselves. We learn from the experimental investigations that, "other things being equal, a long name is a bit important, a short one a little contemptuous;" and 70% of the names in our three novels are of two syllables, 15% of one syllable, and nearly all those of three and four syllables are absurd concoctions like Mutanhed, Slummintowken, etc. Again we are told that the shorter and thinner vowels suggest quick and slight movements and slender objects, *i.e.*, active, small, or more or less insignificant persons; and about 65% of our names have short vowels in the accented syllable; *i* as in *it*, *u* as in *up*, and *a* as in *at* predominate in the order named.[24] Furthermore, short or thin vowels in combination with initial and final stopped-consonants (cat, pet, tip, but, etc.) are so suddenly initiated and quickly stopped as to make these the most insignificant of words; when, however, a suffix is added to such a word, particularly when the final consonant of the stem is doubled or two stopped-consonants are used in combination (Podder, Tadger), an odd, droll, rustic effect is produced, which rests upon the sound of the light vowel in combination with the heavy, ponderous consonants. 66% of the dissyllabic names in our lists have one or more stopped-consonants (b, d, g, p, t, k) in the middle of the name; only 17% have the liquids l, m, n, r; and 7% f, ff, or th. Finally, the variation in the sound of the suffixes, which we have noted above, is significant. Syllables are less sonorous than word-suffixes, and the former prevail in P. P., the latter in N. N. and O. M. F. Furthermore, the word-suffixes in O. M. F. have a greater dignity of sound than those in P. P.

On the whole, it seems clear that Dickens' attitude toward the sound of surnames led him to choose names of a general type; they tend to be short in length, and to consist of short or thin vowels in combination with stopped consonants in the middle of the name. Their suffixes are also thin in sound, but tend to become more sonorous in the later novels. The result is a type of name suitable to the lower and middle classes, and to stupid or silly persons of the upper class, to characters a little contemptible, odd, awkward, clumsy, droll. That there are numerous exceptions only goes to show that the type does not fit all the characters; but it is surprising how few broad, generous, dignified sounds there are in the list.

We cannot, of course, say how many names were recommended to Dickens solely by their sound. There can be little doubt of those like Dibabs, Gride, Grudden, Folair, Petowker, Lillywick, Pickwick,

[23]Gordon, *op. cit.*, 27. Similar instances are here given from other novels.

[24]See references cited by Alspach, *op. cit.*, 440.

Nickleby, and Wrayburn,[25] which do not readily suggest meanings; but in so many instances sound and meaning unite in their effect that it is impossible to say which factor conditioned the choice. Furthermore, it is probable that some of the names which to us are too common to be of any significance whatever were, for Dickens entirely relevant. Our estimate, therefore, of the names that are suitable only by sound (as about 10%) has little value.

(5) Previous experiments have also shown that, if the stimulus-name happens to be identical with or similar to that of a known person, then the person described will frequently have the attributes of the person known. That Dickens was guided by this principle is evident from the name Stareleigh which, as the biographers tell us, is a verbal modification of Gaselee, a judge of the time whom Dickens openly ridiculed.[26] Furthermore, the names Venus, Bladud, Christina, and if our guess is correct Quanko Samba, were apparently also used with the intention of suggesting the originals.

What then, shall we say of the large list of British names, many of which were borrowed from known persons and were therefore familiar to some of his readers, and others of which (like Allen, Green, Jackson, Martin, Williams, Wood) were among the commonest in all England, and were therefore familiar to everybody?[27] Was Dickens psychologically justified in assigning them to his characters? In the first place, we have already seen that he was justified on the score of nationality. In the second place, he may have perceived a suitability in the name despite old associations, and have depended upon the story to furnish new associations which should eventually take precedence of the old. Or, finally, it may be that he employed the name as a tag or label, without raising the question of its suitability. This must certainly have been his motive as regards the very common names: for as a rule they are assigned to secondary characters, and no attempt is made to give them reality. According to our count, 40 of the 327 names, or 12%, have no other significance than that of mere label.

We have found, thus far, in our analysis of Dickens' attitude toward surnames, that he was strongly disposed to employ those that were actual British names, or were derived from these or from English words. He did not invent his names outright, but constructed them by change of suffix or spelling or by intentionally facetious corruption. His selection was conditioned upon nationality; upon explicable meaning (including that reached by auditory-verbal associations); upon the bare sound of the word; and upon the associations aroused by the same or by a similar name. As a result, about half of his names are directly or indirectly descriptive of individual traits. His list as a whole tends toward a type of name which expresses an individuality somewhat contemptible, awkward, clumsy, droll. Many names, nevertheless, have no other significance than that of identifying labels.

There is thus no reason to suppose that Dickens is exceptional in his attitude toward surnames. He is 'highly responsive' to these words; and his keen dramatic instinct,[28] his tendency toward strong lines of characterization (critics have charged him with caricature), and his

[25] Although there may be a pun in Ray-burn and Light-wood.

[26] Kitton, *op. cit.*, 45.

[27] See E. Weekley, *Romance of Names*, 43 ff.

[28] We have found no evidence, though we looked for it, that Dickens took names from the characters of plays.

exuberant animal spirits, have led him to admit punning and farcical names which remain in our memory and shed their glow over the rest.[29] More distinctive than the attitude toward surnames is the attitude which we have discovered toward the *characters* of the novels studied. On the whole, if we may trust the evidence of the names, Dickens tends to look down on his characters; he stands apart and exhibits them, pointing out their weaknesses and uncouthnesses with a sort of good-humored superiority. This collateral outcome of the present study is confirmed, so far as we have read, by literary criticism.

[29] A parallel study—now unfortunately interrupted—of the surnames in George Meredith's novels seems to show that in this as in other respects Meredith is the direct successor of Dickens in the history of the English novel.

NOTES ON THE PRESIDENTS OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

By CLYDE B. MOORE, State Normal School, La Crosse, Wisconsin.

The American Psychological Association since its founding has sought to include within its membership those who are representative of the best work in the fields of psychological research in America. For the most part the membership is made up of members of the departments of psychology in the leading American universities. However it does not necessarily follow that a member of the Association must be connected with a university as witness a recent interpretative note on membership: "A proposal for membership signed by at least two members of the Association must be submitted to the Secretary, for the Council, at least one month in advance of the annual meeting. The proposal must be accompanied (1) by a statement of the candidate's professional position and degrees, naming the institutions by which, and the dates when, conferred, and (2) by copies of his published researches. In the absence of acceptable publications of a psychological character, or a permanent position in psychology, the conditions of membership will not be regarded as having been fulfilled."[1]

The above quotation is indicative of the rare care taken by this organization in the selection of its members. It seems but fair to assume that, with such care in the selection of mere members, the selection of officers for the Association refines the membership process many fold with the result that only the eminent scholar in psychology shall become the head or president of the Association. It is on this assumption that the following investigation was made. The problem was to tabulate and summarize the training of the presidents of the American Psychological Association.

The investigation covers the period of twenty-six years (1892-1917). During this period there have been twenty-five different persons to act as president.[3] (See table.) Of these twenty-five persons twenty were American born and five foreign born. Twenty-four men and one woman have held this office, Mary Whiton Calkins being the only woman to attain this distinction. According to data available all were American citizens at the time of holding office with the exception of Hugo Münsterberg. Nineteen of the twenty-five had received the Ph. D. degree, thirteen receiving the doctorate from American universities and six from European universities. Johns Hopkins and Leipzig tie in the number of doctors attaining the honor each furnishing four, Harvard and Columbia ranking next each furnishing two—Harvard giving the founder and first president in G. Stanley Hall.

Four are natives of the state of Massachusetts, three California, two South Carolina, two Pennsylvania, two Vermont, two New York, and

[1] Psy. Bulletin, Feb. 15, 1917, p. 39.
[2] Proc. Am. Psy. Assn.
[3] Wm. James served as president in 1894 and again in 1904.

TABLE

Year	Name	Native State	Baccalaureate Degree	Doctor's Degree
1892	G. Stanley Hall (1846–)	Mass.	Williams 1867	Harvard 1878
1893	George Trumbull Ladd (1841–)	Ohio	Western Reserve 1864	
1894	Wm. James (1842–1910)	N. Y.		
1895	J. McKeen Cattell (1860–)	Penn.	Lafayette 1880	Leipzig 1886
1896	George S. Fullerton (1859–)	Tatehgarh, India	U. of Penn. 1879	Muhlenberg 1892
1897	J. Mark Baldwin (1861–)	S. C.	Princeton 1884	Princeton 1889
1898	Hugo Münsterberg (1863–1917)	Danzig, Germany		Leipzig 1885
1899	John Dewey (1859–)	Vermont	U. of Vermont 1879	Johns Hopkins 1884
1900	Joseph Jastrow (1863–)	Warsaw, Poland	U. of Penn. 1882	Johns Hopkins 1886
1901	Josiah Royce (1855–1917)	Cal.	U. of Cal. 1875	Johns Hopkins 1878
1902	E. C. Sanford (1859–)	Cal.	U. of Cal. 1883	Johns Hopkins 1888
1903	Wm. L. Bryan (1860–)	Ind.	Ind. Univ. 1884	Clark 1892
1904	Wm. James (1842–1910)	N. Y.		
1905	Mary Whiton Calkins (1863–)	Conn.	Smith 1885	
1906	James R. Angell (1869–)	Vermont	U. of Mich. 1890	
1907	Henry Rutgers Marshall (1852–)	N. Y.	Columbia 1873	
1908	G. M. Stratton (1865–)	Cal.	U. of Cal. 1888	Leipzig 1896
1909	C. H. Judd (1873–)	Bareilly British India	Wesleyan 1894	Leipzig 1896
1910	Walter B. Pillsbury (1872–)	Iowa	U. of Nebr. 1892	Cornell 1896
1911	C. E. Seashore (1866–)	Mörlunda, Sweden	Gustavus Adolphus 1891	Yale 1895
1912	E. L. Thorndike (1874–)	Mass.	Wesleyan 1895	Columbia 1898
1913	H. C. Warren (1867–)	N. J.	Princeton 1889	
1914	R. S. Woodworth (1869–)	Mass.	Amherst 1891	Columbia 1899
1915	J. B. Watson (1878–)	S. C.		Chicago 1903
1916	Raymond Dodge (1871–)	Mass.	Williams 1893	U. of Halle 1896
1917	Robert M. Yerkes (1876–)	Penn.	Ursinus Coll. 1897 Harvard 1898	Harvard 1901

two were born in India. Ohio, Indiana, Connecticut, Iowa, New Jersey, Sweden, Germany and Poland have each furnished one.

Honorary degrees have been conferred on a number of the presidents and several hold professional degrees in medicine and theology. Many have received international recognition in different ways and not a few hold superior ratings in other fields of science. Several hold responsible executive positions, G. Stanley Hall and Wm. L. Bryan as university presidents. Charles Hubbard Judd sustains the distinction of being the youngest at the time of his election to the presidency and Wm. James the only person to have the honor of twice serving as president. Three of the group have completed their work, Wm. James passing in 1910 and Josiah Royce and Hugo Münsterberg in 1917.

BOOK NOTES

An ethical philosophy of life, presented in its main outlines. By FELIX ADLER. New York, D. Appleton and Co., 1918. 380 p.

This book records a philosophy of life growing out of the experience of a lifetime. The convictions put forth in it are not dogmatic if dogma is the conviction of one man imposed authoritatively on others, but they are simply submitted to those who search for light on the problems of life, and the author hopes that some of his fellow searchers will find these views congenial and that still others will find practical suggestions that are useful. The book is divided into four parts: autobiographical introduction; philosophical theory; its applications to life, sickness, sin, property, reputation; and fourth, the theory as applied to social institutions, family, state, etc. The chief problems are how to establish the fundamental ethical dictum that everyone should count. We need also to know how to attach precise meaning to the term spiritual, also how to link up the world's activities in science, art, business, etc., with the supreme ethical end; and lastly, how to lay foundations whereon to erect a conviction that there really is a supersensible reality. This work is a summary of a lifetime and in it are found epitomes of most of the author's other writings, so that it is a work of great value.

The field of philosophy; an outline of lectures on introduction to philosophy. By JOSEPH ALEXANDER LEIGHTON. Columbus, R. G. Adams and Co., 1918. 414 p.

This was prepared for class work. The author's point of view is so unique that it is a little difficult to tell whether we have before us a history of philosophy or a treatise on epistemology. If Zellar's conception of the function of a historian of philosophy is correct, that he must so completely efface his own views that he seems to the reader to have no system himself, this writer has lamentably failed, for everything historical is colored by the author's opinion. Moreover, there is no one else in the world who would define the field of philosophy as this writer has done, still less give the topics he includes the same perspective. Are not works like this still in what Hegel called the animal kingdom of mind? Do they not represent a kind of self-indulgence which in our age of science ought to be past? The strange amalgam of theory and sentiment in regard to such problems as the self and evolution may give a certain amount of orientation to novices, but there is too much indoctrination. The whole book might have had the title of one section, viz., "My Own Standpoint."

The psychology of conviction; a study of beliefs and attitudes. By JOSEPH JASTROW. Boston, Houghton Mifflin Co., 1918. 387 p.

The author has chapters on the feminine mind, belief and credulity, the case of Paladino, militarism and pacifism, "malicious animal magnetism," the psychology of indulgence, the psychology of conviction, fact and fable in animal psychology, the democratic suspicion of education, the will to believe in the supernatural, and antecedents of the

study of character and temperament. Most of these papers are reprints from various magazines. The author writes fluently, perhaps too fluently, but it is unfortunate that he betrays no knowledge of the best literature in quite a number of the fields he treats, and this gives to not a few of his conclusions and presentations a touch of triteness, at least for the expert who knows. The time has gone past for general psychology. Everyone who would be an author now must limit himself to a single and small portion of the field. Books like this are a survival of a stage of psychologizing that is rapidly passing.

The gate of remembrance. The story of the psychological experiment which resulted in the discovery of the Edgar Chapel at Glastonbury. By FREDERICK BLIGH BOND. Oxford, Blackwell, 1918. 176 p.

The green isle of Glaston, isolated by a girdle of marsh and mere, was once a haunt of peace. Here were the first Christian missionaries, who evangelized Britain. There were later waves of pagan immigration, but the lamp of truth was never extinguished. The heritage of Glaston was not that of an individual but of all. Here lies the dust of many holy men. Kings made her great. In 1539 it was surrendered and the last abbot executed. The art treasures were dispersed, and nothing more was heard of Edgar Chapel. Perhaps it was one of the first buildings to be utterly destroyed and even its memory was almost gone, save a few traces in local tradition; but in 1908 came a discovery by the psychic researchers and the record here is compared with such traces as history has left us.

Psychology and preaching. By CHARLES S. GARDNER. New York, Macmillan Co., 1918. 389 p.

Psychology has often been applied to teaching, but here it is applied to preaching, thus undertaking to do for preachers what educational psychology does for the pedagogue. The author treats the mental processes involved in preaching, after a general discussion of mental processes, and then he takes up the psychology of the mass as they appear in assemblies and community groups, then three occupational types, the minister, the laborer, and the business man. He then discusses modern mind or the peculiar attitudes of modern men as contrasted with more primitive men. It should interest not merely preachers but all who care for religious problems and indeed public speakers generally ought to find new points in it.

Psychical phenomena of the war. By HEREWARD CARRINGTON. New York, Dodd, Mead & Co., 1918. 363 p.

In these papers the author tries to study the psychological forces at work in the present war, and divides his book into two parts, one dealing with psychology proper, applied to the mind of nations and of individuals, and the other to psychical or supernormal phenomena of a largely spiritistic character. Thus Part I studies the mind of the soldier up to the point where he is killed in action, while "Part II" continues our study of the same soldier after his death. We thus extend our inquiry into the realms of the vast beyond and seek to bring back from that unknown land definite knowledge of those who sojourn there. For the first part the author leans a good deal upon Le Bon and Crile. The best article in the book is a reprint of the author's "The Mind of the Soldier," from the Forum for January, 1916.

The language of color. By M. LUCKIESH. New York, Dodd, Mead and Co., 1918. 282 p.

There is a lack of correlation between the sciences and the arts, which is due to the difficulty of an individual in adapting himself to these two viewpoints. The author accordingly divides his work into four parts, as follows: Part I, mythology, association, nature, primitive language, literature, painting, ecclesiasticism, theatre; Part II, symbolism of color, red, yellow, green, blue, white, black, gray, various colors; Part III, nomenclature, psycho-physiology of colors, color preference, affective value of colors, attention value of colors; Part IV, esthetics, harmony, color practice, color-music, finale, and bibliography.

Cours de psychologie et de philosophie. I. Psychologie. By E. BAUDIN. Paris, Ancienne Librairie Poussielgue, 1917. 618 p.

The author treats the following topics: three psychologies; the object of psychology; physics and morals; method of psychology; determination of psychological laws; attention; habit; conscience; self; sensation in general; sensations; perception of movement, space and time; images; association; memory; perception; imagination; what is thinking; the idea; judgment; reason; the reason or the principal directors of knowledge; belief; language; the inclinations; pleasure and pain; emotions; passions; character; instinct; psychological automatism; will; liberty.

The Stanford revision and extension of the Binet-Simon scale for measuring intelligence. By LEWIS M. TERMAN and others. Baltimore, Warwick and York, 1917. 179 p.

This monograph summarizes the data on which the Stanford revision and extension of the Binet scale rests and gives an analysis of the results secured by the application of the revised scale with nearly a thousand unselected school children. The complete guide for giving and scoring the tests and for the interpretation of results is published separately ("The Measurement of Intelligence") so that these two volumes belong together.

The mental survey. By RUDOLF PINTNER. New York, D. Appleton and Co., 1918. 116 p.

This work is an attempt to develop a method of tests for large groups. In discussing the tests and their standardization, the author treats more specifically the computations and the results, the surveys of schools, the survey tests and other estimates of intelligence, and educational accomplishment and mental ability. Part II consists of a guide for the use of the survey tests.

Dynamic psychology. By ROBERT SESSIONS WOODWORTH. New York, Columbia University Press, 1918. 210 p.

This work treats of the modern movement in psychology, the problems and methods of psychology, native equipment of man, acquired or learned equipment, the factor of selection and control, the factor of originality, drive and mechanism in abnormal behavior, drive and mechanism in social behavior.

Manual of vital function testing methods and their interpretation. By WILFRID M. BARTON. Boston, Richard G. Badger (1917), 2d ed. 318 p.

Save for this book function tests bearing on the diagnosis of diseases of the heart, kidney, liver, pancreas and ductless glands have

remained scattered in medical journals of many languages, but this manual attempts to bring this important material together. It is a most timely book.

Essai sur l'introversion mystique; étude psychologique de pseudo-Denys l'Areopagite et de quelques autres cas de mysticisme. By FERDINAND MOREL. Genève, Librairie Kundig, 1918. 338 p.

The author first considers the psychology of the pseudo-Dionysius the Areopagite, beginning with an historic orientation and a resumé of the symptoms, rite, myth, ecstasy, and metaphysics of Dionysius. The second part treats of the introversion of Oriental, of spiritual, and of orthodox mystics—these three.

The influence of age and experience on correlations concerned with mental tests. By EDWARD SAFFORD JONES. Baltimore, Warwick and York, 1917. 89 p.

The Witmer cylinder test. By FRANKLIN C. PASCHAL. Hershey, Pa., Hershey Press, 1918. 54 p.

Experimental tests of mathematical ability and their prognostic value. By AGNES LOW ROGERS. New York, Teachers College, 1918. 118 p.

The picture completion test. By RUDOLF PINTNER and MARGARET M. ANDERSON. Baltimore, Warwick and York, 1917. 101 p.

Report on some measurements in spelling in schools of the Borough of Richmond, City of New York. Issued by the Division of Reference and Research. EUGENE A. NIFENECKER, Assistant Director, 1917. 88 p.

The psychology of special disability in spelling. By LETA S. HOLLINGWORTH, assisted by C. Amelia Winford. New York, Teachers College, 1918. 105 p.

Training pupils to study. By H. B. WILSON. Baltimore, Warwick and York, 1917. 72 p.

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